Effective information provision on smart home technology

A report by The Behavioural Insights Team for Citizens Advice
Carolin Reiner, Abigail Mottershaw, Pantelis Solomon, Janna Ter Meer and Filip Murar

THE BEHAVIOURAL INSIGHTS TEAM

In partnership with

Cabinet Office

citizens advice

Table of contents

Executive summary ……4

Introduction……13
- ❖ Background and policy context
- ❖ Applying BIT's project methodology TESTS
- ❖ Project timeline
- ❖ Why run online experiments

TARGET……...19

EXPLORE……...….21

SOLUTION……...26

TRIAL……43

Conclusions and SCALE……76

Appendices……83

Acknowledgements

We would like to thank stakeholders who attended the ideation workshop - this includes colleagues from the Renewable Energy Consumer Code, Energy Systems Catapult and the Department for Business, Energy and Industrial Strategy.

We would also like to thank the Flexible Energy Oversight Registration Body (Flexi Orb) for their feedback during the project.

Executive summary

The energy market is changing. Decarbonisation and the data revolution are driving the development of new products and services that may significantly changing the way consumers engage with their energy consumption. One result of these developments are complex products like smart battery storage. These are products that could interact with a household's energy consumption in different ways - some of which may be unfamiliar to many consumers. Whether or not a household benefits from using smart battery storage hinges on the interaction of a range of factors. In turn this means, consumers need to pay close attention to whether or not purchasing smart battery storage can actually benefit them.

If consumers are to deal with the increasing complexity of the energy market, it is paramount they understand how products like smart battery storage work and that they can rely on industry to provide all necessary information in a simple and accessible way. To that end, Citizens Advice, the statutory body for energy consumers in Great Britain, wants to know what and how much information works, when helping consumers to understand the value of smart appliances like smart battery storage

This report summarises the results of a research project conducted by the Behavioural Insights Team (BIT) for Citizens Advice to establish an early evidence base for what might constitute effective information provision in the smart battery storage industry.

This research project

The main purpose of this research was to understand how to drive consumer comprehension of the key benefits and requirements of smart battery storage.

We also looked at consumer trust in manufacturers and engagement with the information. To that end, we conducted light-touch qualitative research as well as an online laboratory experiment comparing consumer comprehension (as well as trust and engagement) of product information about smart battery storage. We developed three ‘behaviourally-informed’ versions of product descriptions (prototypes) and compared these to a ‘business as usual’ one that mimics the quality of information observed on manufacturer’s websites to date.

Key results

We found that overall comprehension improved when we used icons and visuals to illustrate some of the elements conveyed in the product descriptions. All the prototypes improved comprehension of the benefits of smart battery storage, but not of their requirements, although we should note that overall more participants were able to recall the requirements than the benefits. While the prototypes didn’t improve the understanding of the financial trade-off between the benefits, overall participants grasped this well. A risk warning at the bottom of the product description was effective at making participants realise that a good purchasing decision in this market should be based on a rigorous cost-benefit calculation involving many individual factors. At the same time, this risk warning was seemingly so salient that it diverted participant’s attention away from the rest of the information, such as information on the environmental benefit of smart battery storage. The risk warning didn’t influence the proportion of people seeking out more information during the experiment.

The qualitative research revealed that among the three key benefits, participants mainly struggled to understand the mechanisms of signing up to a flexibility service.

Executive summary

We also found that the inclusion of a government-endorsed kitemark, the Trustmark, had no real impact on the level of self-reported trust in manufacturers of smart battery storage. Finally, we found that the prototypes did not increase the level of engagement or interest in the product, measured by whether or not participants in the experiment sought additional information.

Project methodology

To conduct this research, we used BIT's project methodology TESTS, an acronym describing a five-phase process:

TARGET **- defines the objective and scope of the project.**

We identified three key outcome measures of the project, where **consumer comprehension** was the primary focus and consumer **trust** in manufacturers to provide good information as well as **engagement** with the information were secondary outcome measures.
To measure comprehension, we had to define exactly what product information we wanted to improve comprehension of. We prioritised the following elements of product information:

- **Three requirements for use:** Having a smart meter, a time of use tariff and a cool and dry storage space for the battery system
- **Three benefits of use:** Harnessing a time of use tariff, using solar energy, signing up for a flexibility service
- The direct **financial trade-off** between the above benefits

EXPLORE **- aims to understand the context, the key barriers to comprehension and existing evidence of similar interventions.**

We conducted an evidence review looking at studies that have examined how phrasing, style and format of information provision can impact comprehension of and trust in the information. We collated findings from the academic literature and also drew heavily on BIT's evidence base of similar online comprehension experiments in other domains. They key findings are summarised in this report, and the full evidence review is provided in Annex E.

SOLUTION **- generates ideas to address the key target of the project using behavioural insights.**

Based on the findings from the evidence review and BIT's expertise in behavioural science, we developed nine options for potential prototypes. In collaboration with Citizens Advice, we filtered these down to three final prototypes. The prototypes were compared to a 'control condition' - product information broadly mimicking the quality of product information currently provided by manufactures. We tested two versions of each prototype and the control, in each case with and without the government-backed 'Trustmark'.

Each prototype, as well as the 'control' condition, contain a 'summary paragraph' that briefly addresses all information elements as defined in TARGET, and that we subsequently tested comprehension of. The prototypes are explained in more detail on the subsequent slide and both these and the control are displayed in full in the SOLUTION section of this report.

Executive summary

TRIAL - robustly evaluates the impact of the ideas chosen.

We tested the impact of the prototypes in two steps: The first step was a light-touch qualitative research phase with six consumers in vulnerable circumstances. Each participant was shown one of the prototypes and we subsequently conducted in-depth interviews to gauge their comprehension of the information at hand.

Secondly, we conducted an online laboratory experiment using BIT's in-house experimentation platform Predictiv. We recruited a sample of ~1800 participants that are representative of the UK population on key demographic variables. Upon entering the experiment, they were randomly divided into eight groups that each were presented with either the control or one of the prototypes, with or without the Trustmark.

We subsequently took all participants through a survey with a set of questions aimed at measuring how well participants understood the product elements as defined in the TARGET phase, how much they trusted the manufacturers to provide good information and how interested they were in reading more about smart battery storage (engagement). Finally, participants were taken through a series of demographic and other additional questions that gave us a better picture of the characteristics of the respondents.

SCALE - attempts to elevate positive interventions and findings onto a larger-scale.

We synthesise the results into suggested principles of effective information provision for the smart battery storage industry (as displayed in the subsequent slides of this executive summary.)

At this stage, scaling the results of this particular research is, in the first instance, about taking concrete steps to replicate the findings and to validate them in the field. We suggest replication of the online experiment using a 'best of' prototype which brings together the most effective elements of the three prototypes tested here. Subsequently, we recommend field research to understand the extent to which effective information (whether static or interactive) can lead to good consumer outcomes in real-world conditions, or whether more stringent regulation is required to prevent consumer detriment in the market for smart battery storage.

The subsequent slides of this executive summary contain the following elements:

- A summary of the prototypes;
- A summary of and key communication principles based on the qualitative research; and
- Key communication principles based on the results of the online experiment.

Executive summary - the three prototypes

P1: FAQ format

This prototype includes the summary paragraph and three more paragraphs - two for the financial benefits and their related requirements and one on the environmental benefit. The second paragraph states the trade-off between earning an income and reducing one's electricity bill, and the final paragraph outlines the mechanisms behind the environmental benefit.

Behavioural insight: This way of disclosing the information was expected to engage the reader with the content. The FAQ format also helps to structure the information in paragraphs that contain bite-sized information that is more easily digestible and might preempt the readers' thoughts and the answers directly address the reader with 'you'.

P2: P1 (FAQ) + long risk warning

The second prototype builds from the first. It uses the exact same text as P1 and in addition includes an orange, salient call-out box at the bottom that voices a (long) risk warning about the product. It explicitly states that buying smart battery storage is not for everybody and lists a number of elements, consumers need to collect information before they're able to assess (through a cost-benefit analysis) whether their household would benefit from investing in smart battery storage.

Behavioural insight: There is some evidence to suggest that longer risk warnings for complex and less well-known risks tends can be effective. We wanted to test if that was applicable in the context of smart battery storage.

As P1 and P2 only differ in that P2 includes the risk warning, we will be able to draw direct comparisons between these two prototypes.

P3: Triage tool + trade-off visuals

The final prototypes is the longest. It contains two parts that were shown beneath each other. The first part is labelled as a 'triage tool', i.e. a tool to enable consumers to assess easily if this product is for them. It does that by asking two questions: one about requirements that are indispensable and another one requirements conditional on the use mode or benefit.

Behavioural insight: 'Decision tools' like this one are popular to break complex decision processes down into easy, small steps. Making things easy is one of the key drivers of comprehension and behaviour change.

The second part is a set of visuals that aims to illustrate the financial trade-off between the different use modes, in particular the loss of capacity related to signing up with a flexibility service. We also use icons and colours to illustrate each use mode.

Behavioural insight: Visuals are effective in communicating complex information in a salient and memorable way.

Executive summary - experimental findings, and recommended communication principles

Communication Principle	Trial Findings
Communication principle #1: Illustrating complex information with visual cues increases comprehension.	P3 (triage tool + trade-off visual) was the only intervention which significantly improved overall comprehension in comparison to the control.
Communication principle #8: Manufacturers can increase comprehension of the environmental benefit by explicitly stating it. But if other elements are highlighted in a very salient way (e.g. call out box) it can divert the attention away from the environmental benefit.	P1 (FAQ) and P3 (triage tool + trade-off visual) both significantly increased comprehension of the environmental benefit. However, P2 (FAQ + risk warning) didn't have an impact.
Communication principle #10: An explicit risk warning makes people more risk averse by inducing more conservative perceptions about the potential benefits of smart battery storage. At the same time it doesn't put consumers off from seeking out more information (see principle #9).	Only P2 (FAQ + risk warning) yielded a different estimate from the control, of how much participants thought smart battery storage could save them on their energy bill. Given there is no difference in outcomes between the control and P1, the risk warning might have made participants more sensitive to complexity involved in harnessing all benefits.
Communication principle #6: 'Longer' risk warnings are effective in the context of smart battery storage at drawing attention to the cost benefit calculation necessary to decide if it's a worthwhile investment.	P2 (FAQ + risk warning) substantively increased comprehension of the cost-benefit analysis involved in making the right choice about purchasing smart battery storage.

Executive summary - experimental findings, and recommended communication principles

Communication Principle	Trial Findings
Communication principle #5: Stating that there is a financial-trade-off between benefits is sufficient to achieve decent levels of comprehension. Salient risk warnings on other trade-offs can divert attention away.	Although none of the prototypes increased comprehension of the financial trade-off between benefits, baseline comprehension was relatively high in comparison to other elements of the product information. We saw that participants in P2 (FAQ + risk warning) seemed to understand the trade-off the least. The risk warning might diverting their attention away from other elements in the prototypes.
Communication principle #7: Consumer attention is limited to the extent that lengthy information on the benefits of smart battery storage draws away attention and reflection from implicit consequences, such as the cost-benefit analysis.	P1 (FAQ) significantly decreased comprehension of the cost-benefit analysis. As P2 increased comprehension and the only difference between P1 and P2 was the risk warning, we think the risk warning makes up for the adverse impact P1 has on comprehension in comparison to the control.
Communication principle #4: The requirements are better understood than the benefits but should still be communicated saliently, not just in association with the respective benefits they serve.	None of the prototypes improved comprehension of the requirements. The narrative in all three prototypes was structured around the benefits rather than the requirements.
Communication principle #11: A government-endorsed trustmark does not increase self-reported trust in manufacturers to provide truthful and comprehensive information.	There was no significant difference in the level of self-reported trust in the manufacturer as a result of including the Trustmark.

Executive summary - experimental findings, and recommended communication principles

Communication Principle	Trial Findings
Communication principle #3: There is a clear need for more and better information provision on the basic benefits of smart battery storage than is currently found on manufacturer websites.	All our prototypes directionally improved comprehension of the benefits of smart battery storage in comparison to the control condition. In comparison to actual product descriptions to date, the improvement of comprehension of benefits might be even stronger given that the quality of our control was better than the current business as usual.
Communication principle #9: Overall, none of the prototypes changed the likelihood of consumers seeking out more information. More research is needed to understand what drives engagement with more information as different elements of the prototypes may have worked in different directions. Visuals and risk warnings might be more engaging, better information on manufacturer's websites might reduce the need to search for other information.	None of the prototypes significantly increased the proportion of participants seeking out more information when they were prompted to click on a consumer guidance report on smart batteries and solar power after having been through the comprehension questions. This measure was not intended to measure engagement with the subject or the product itself but the extent to which participants are interested to read more.
Communication principle #2: Robust field trials are necessary to understand the impact of product disclosures on actual purchasing decisions, consumer detriment and thus what it means for regulatory policy.	Results from this laboratory online study don't allow us to make any conclusions about how product disclosures impact actual purchasing decisions about smart battery storage, and therefore our understanding of the effect of the prototypes (and improved comprehension) on the prevention of consumer detriment is limited.

Executive summary - qualitative findings

- Generally, respondents understood that a smart battery could save them money by storing energy when it was cheaper.
- However, all but one, misunderstood how they could generate income from letting suppliers use their battery's storage capacity. Some thought that they would be paid to sell their stored energy back to the supplier, whereas others thought they were being paid to use their own stored energy instead of taking it directly from the grid during periods of high demand.
- The reference to the grid being under stress tends to be interpreted as the grid struggling to meet demand rather than it being unable to store excess energy, so could be misleading.
- Some respondents better understood the concept of energy suppliers using householder's battery storage capacity when the interviewer described it along the lines of the 'supplier renting out the storage capacity of the battery'.
- The three requirements for being able to have a smart battery were clearer to those respondents who viewed P3, as they are presented separately in bullet points. This shows how well bullet points work in highlighting information. Otherwise, people tended to focus only on the smart meter as they all knew what one was, and less so on 'time of use tariff' as they did not know what this meant. The explanation of the 'time of use tariff' is often missed so probably needs to be more prominent.
- The investment risk is broadly understood by those who viewed P2, but could benefit from more explanation, or an example of when it would and when it would not be worthwhile. There is potential for this information to be ignored because of the way it is presented; it is at the bottom, in a box, which makes people think it is the small print or terms and conditions.

Executive Summary - Communication principles based on qualitative research

We synthesise the findings from the qualitative research into two communication principles that we think are valuable to consider, in particular with a view towards vulnerable consumers.

Communication Principle based on vulnerable consumers	Interview Findings
Communication principle #1: Product information on manufacturer websites is likely insufficient to enable consumers to adequately interact with and benefit from flexibility markets.	Earning an income from signing up to a flexibility service was the benefit participants struggled to understand the most. It seemed they were generally confused about why and how an energy supplier would pay them and what they are offering the supplier in exchange.
Communication principle #2: The increasing complexity of the energy market will require much simpler and better communication of key concepts like ‘kilowatt hours’ or ‘time of use tariffs’.	Complex but commonly used terms such as ‘kilowatt hours’ and especially ‘time of use tariff’ was not well understood and therefore limited consumers comprehension of the features of smart battery storage.

Introduction

THE
BEHAVIOURAL
INSIGHTS
TEAM

Introduction

This report summarises the findings of a research project conducted to identify effective ways to communicate to consumers the key benefits and requirements of smart battery storage. The findings aim to provide businesses, policymakers and advocacy groups with early evidence of consumer comprehension based on different types of information provision (one baseline and three prototypes). From this we have generated high-level principles which could be applied to this nascent market to help prevent consumer detriment and build trust.

Background and policy context

As new products and services come onto the market, consumers will be faced with a rising number of new and difficult choices. This includes evaluating and deciding whether to purchase a smart appliance, such smart battery storage.

Smart storage systems allow you to store electricity when it is readily available and use it at a later point. They can help consumers lower their electricity costs and help turn their and the entire grid's electricity greener. However, these benefits are intrinsically linked to the offers a consumer has, such as a time of use tariff or flexibility service, as well as the technical requirements to use such a product.

Currently, purchasing smart battery storage would be a premature investment for the majority of energy consumers because they lack the necessary preconditions. This could be a challenge as smart battery storage systems become more available while most consumers aren't aware of the intricacies related to the use of smart battery storage. One key element of this problem is ineffective information provision. Manufacturer websites are one of the first places consumers collect information about smart battery storage, their benefits and requirements, but the current level of information provision on these product websites is low, and of poor quality. As the market grows and more consumers become aware of and consider purchasing smart battery storage, the risk of consumer detriment is growing, too. One lever to prevent consumer detriment is to ensure consumers are aware and understand the intricacies of these products.

Citizens Advice therefore aims to establish and test good practices in the communication of product information for this emerging industry. In other words, the goal is to ensure that consumers are equipped with the necessary guidance to make the best decisions for themselves.

Introduction

To that end, Citizens Advice commissioned the Behavioural Insights Team (BIT) to conduct research on how information can be phrased, styled and formatted to maximise consumer comprehension of the basic benefits and requirements associated with smart home technology.

The Behavioural Insights Team (https://www.bi.team/) exists to improve people's lives and communities. We work in partnership with governments, local authorities, businesses and charities. Established in 2010, we were the world's first government institution dedicated to the application of behavioural science. We independent social purpose consultancy with offices around the world.

Throughout this project, we followed BIT's 5-step project methodology TESTS to conduct this research: Target, Explore, Solution, Trial, Scale. Accordingly, the subsequent sections of this report are structured along those phases:

Target, establishes the scope and focus of the product information to be tested.

Explore, provides a summary of a separate evidence review conducted on principles of effective information provision.

Solution, comprises the idea generation and prioritisation phase. For this particular research, this was not only a process of developing new ideas for effective communication, but also establishing what 'business as usual' communication and information looks like, in this nascent industry.

Trial, is about testing the prototypes, developed and prioritised in Solution, for impact. We do this through a small set of interviews with consumers in vulnerable circumstances as well as a quantitative online experiment.

Scale, is about synthesising the results from our research into early communication principles for industry and policy-makers to build on. We also suggest replicating and validating the results as the immediate next steps to scale these findings.

Applying BIT's TESTS project methodology

The project followed BIT's project methodology called TESTS. The five phases (Target, Explore, Solution, Trial and Scale) are described in more detail below:

TARGET defines the objective and scope of the project. The main goal of the project is to identify principles of effective information provision that improve consumers' comprehension of the benefits and requirements related to smart battery storage. A secondary goal was to understand how information could increase consumer trust and engagement.

EXPLORE aims to understand the context, the key barriers to comprehension and existing evidence of similar interventions. We conducted a high-level evidence review focusing on interventions and principles that could increase comprehension and to a lesser extent also trust. We conducted a high-level review of the academic literature and also heavily drew on BIT's existing research and evidence on what drives comprehension.

SOLUTION generates ideas to address the key target of the project using behavioural insights. We conducted a workshop with external stakeholders to develop a long list of solution ideas which would increase comprehension and trust. BIT then prioritised the best and most feasible ideas. The content of the information provided was the same throughout all conditions but the information varied in structure, illustration, language and salience. We were able to take three of the prototypes (behaviourally-informed product descriptions/ information conditions) forward to the TRIAL stage.

TRIAL robustly evaluates the impact of the ideas chosen. This phase had two components: We first tested the prototypes through in-depth interviews with six consumers in vulnerable circumstances. We then conducted on online experiment with a representative sample of the general population to measure the impact of the three prototypes on participants' comprehension, engagement, trust and estimates about how much smart battery storage could help them save on energy costs.

SCALE synthesis of findings into early communication principles and replication and validation. We do this by distilling our results into early principles of effective information provision in the context of smart home technology and by suggesting concrete steps for replicating and validating the findings in the field to advance towards the development of a comprehensive 'best practice' guidance for industry.

Illustration of the project phases

Target
Setting clear objectives, prioritising information to be conveyed

Solution
Co-creation workshop, develop behaviourally-informed prototypes

Scale
Synthesis of findings into early principles of effective information provision & suggestions for replication and validation of findings

Explore
Rapid evidence review on comprehension and trust

Trial
Consumer-testing-type interviews with 6 consumers in vulnerable circumstances
&
Online experiment with sample of general population

Evidence-based policy: Why run online experiments?

Evidence-based policy demands robust empirical evidence. Having identified the research questions and scope, we considered the best research design to answer those questions. In this case we opted to evaluate the impact of behaviourally-informed prototypes on consumer comprehension.

Randomised Controlled Trials (RCTs) are the 'gold standard' of impact evaluation research designs. They aim to identify the causal impact of an intervention on outcome(s) of interest - in this case comprehension. They do this robustly by incorporating two key components: One, the presence of a counterfactual sample who do not receive the intervention (creating a 'treatment' and 'control' group), and two, random assignment of the trial population into these groups.

For the purposes of this research, we developed a 'control condition' that matched the current 'business as usual' quality of information provision. Our 'behaviourally-informed prototypes' acted as the 'treatments'. The purpose of the control group is to identify what level of comprehension we can expect from product information currently found on manufacturer websites. This allows us to robustly estimate the comparative benefit (or detriment) or the behaviourally-informed prototypes. Random allocation of the sample between the control and treatment conditions ensures that receipt of either one of the prototypes is not correlated with any other confounding variables, i.e. we are comparing 'like for like'.

Online lab experiments

For the purpose of this specific research, an online laboratory experiment was most appropriate for a number of reasons: The laboratory (online or not) offers a controlled environment in which to test hypotheses. Their main advantage is that the researcher has great control over all factors, and has the opportunity to measure with great precision and specificity. As we were interested in measuring comprehension of product information, rather than sales of smart battery storage (or any other 'observable' outcome) for instance, a laboratory environment offers a good platform to develop ways in which to measure these without having to rely on self-reported measures.

Lab studies, though highly accurate and able to focus on specific psychological outcomes such as comprehension, are removed from the 'real world'. As such, it is often valuable to use them as a precursor to subsequent field studies, in which real-world behaviour is measured. A future field-trial would reveal the extent to which increased comprehension leads to better purchasing decisions, or whether further consumer protections may be necessary."

TARGET: Identifying the information consumers need to understand

THE BEHAVIOURAL INSIGHTS TEAM

Defining the research focus: The benefits and requirements of smart battery storage

We identified three key outcomes we wanted to influence among consumers considering a smart battery purchase:

- **Comprehension and understanding** of the product's various benefits and technical requirements (both expanded on below)
- **Trust** in the information, tested through inclusion of a Trustmark.
- In addition, we also measured participant's **engagement** with the content and the experiment.

To measure comprehension, we first had to identify the key information about the product that we would like consumers to understand in order to be able to better navigate the market. We focused on key requirements to and benefits of using smart battery storage, as described below:

Comprehension of technical requirements:

In order to take advantage of the benefits, a household needs:

- a smart meter;
- a time of use tariff; and
- a cool and dry storage space for the battery system

Comprehension of benefits:

There are several potential benefits from using a smart battery, depending upon a customers use-case:

- **Harnessing a time of use tariff:** If you are on a time of use tariff, you can reduce your energy bills by storing energy when it's cheapest (over night) and using it to power your home when new energy is expensive (peak times during the day).
- **Using solar energy:** In combination with solar panels, smart battery storage can reduce your energy bills by optimising the share of solar energy you generate and use.
- **Signing up to a flexibility service:** You can earn an income by lending your battery's capacity to a third party who uses it to stabilise the grid. By including the income from flexibility services as a key benefit, we attempted to 'future-proof' our findings to elements of the market that aren't yet mainstream
- A fourth element was to ensure that consumers **are aware of the direct financial trade-off** between using smart battery storage to reduce one's energy bill (harnessing a TOU tariff + solar energy) and earning an income from signing up to a flexibility service

Key takeaway: These three requirements, three benefits, and the financial trade-off between these benefits form the basis of our research, and what the prototypes were designed to improve comprehension of.

EXPLORE 1: Evidence review

Key findings

THE
BEHAVIOURAL
INSIGHTS
TEAM

Methodology and scope of the evidence review

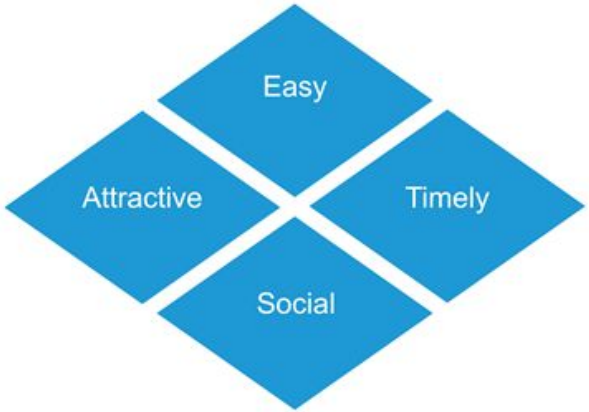
The next stage of the project consisted of reviewing existing evidence on which communication methods are effective in improving people's understanding of information. This included phrasing, style, and format of information. We reviewed the wider academic literature and heavily drew on BIT's in-house evidence from our own comprehension experiments. We looked at evidence from across the policy spectrum.

We also looked at whether the type of messenger influences the level of trust and engagement readers have in and with the information shown to them. The actual evidence review can be found in a separately published appendix. We have summarised the key findings in the subsequent slides:

For the purposes of this review, we defined comprehension to mean that consumers correctly understand the information that is presented and are able to accurately apply the information. Comprehension can be measured empirically by asking consumers to answer multiple choice questions about information they have viewed, or to differentiate between products based on that information. We limited this review to research that directly measures comprehension using these methods, as opposed to research that tries to infer consumer comprehension from consumer choice.

We categorised the techniques for improving consumer comprehension using BIT's 'EAST' framework - a toolkit dividing behaviour change techniques into four categories, advocating that *behaviour change and comprehension can be aided by making the desired outcome Easy, Attractive, Social and Timely.*

The full evidence review can be found in Annex E.



Summary of findings from the evidence review: Improving comprehension

EASY - reduce the required effort

Simplifying & Include only essential information: 'Information overload' refers to the concept of receiving so much information that our brains struggle to process and sort it. (Eppler & Mengis, 2004). Using fewer words to communicate concepts can be effective, as long as shortening the text does not affect clarity. Shortening text has been shown to increase consumer understanding of terms and conditions and privacy policies and is considered a best practice in the field (Harris, 2013; Grannis, 2014).

Display number in practical units (avoid percentages): The literature shows that people find performing calculations a significant source of friction, i.e. hassle. Presenting numbers in relevant units for decision-making (e.g. the amount that a new tax will cost per paycheck rather than just the increase in the tax rate) removes the friction of performing calculations. (BIT, 2018b). Evidence also suggests that displaying numbers in natural numbers instead of percentages increases comprehension in medical and financial contexts (Ahmed et al., 2012; Hoffrage et al., 2000).

Use categorical labels with summary statistics/grades: Simplifying information into categories reduces the amount of information readers must process. Studies have shown that using categorical labels, such as stars or letter grades, leads to better comprehension than using continuous scales to present information. (Loewenstion, Sunstein, & Golman, 2014).

Standardise formatting to allow for comparisons: Loewenstein, Sunstein, and Golman (2014), if information is not presented in a way that allows comparisons, people might not do the cognitive work to enable them to make comparisons on their own. Standardising the format of information has proven effective in many fields (Loewensten, Sunstein, & Golman, 2014), including consumer policies.

Include all necessary information on a single screen/page: People are more likely to comprehend information when it is physically or cognitively less effortful to consume it. BIT found that displaying terms and conditions in a scrollable text box instead of a separate link increased the average number of comprehension questions participants were able to answer correctly. (BIT, 2019)

ATTRACTIVE - make it appealing

Harness loss aversion: There is evidence that harnessing loss aversion can lead to better understanding of content related to the implied loss. BIT worked with the Australian Energy Regulator (AER) to conduct three online experiments to test different versions of a proposed benefit change notification (BIT, 2018e). We found that including a headline telling respondents that they would 'lose [their] discount' led to higher comprehension of the content of the notice related to costs,

Summary of findings from the evidence review: Improving comprehension

Present information visually: People respond to stimuli that are 'salient'--those that are novel, simple and accessible. **Presenting information visually has been shown to improve comprehension of many types of information.** As part of BIT's series of work on improving consumer comprehension of online terms and conditions (BIT, 2019), we found that summarising key terms and illustrating them with explanatory icons increased understanding by 34%.

Use eye-catching 'stop signs' to signal products to avoid: We are more likely to engage with something that our attention is drawn towards (BIT, 2014). **Stop signs are more effective at catching consumer attention than more detailed labelling systems, and facilitate comprehension of poor quality products.**

SOCIAL- leverage our social natures

Make information relatable to the consumer: A common strategy in behavioural science is 'personalisation'. When personalization is not possible, making information 'relatable' to the reader may accomplish the same goal. In BIT's and BoE's experimental study of the Bank of England Inflation Report, we found that making the content of the report relatable to the reader was effective, i.e. by increasing the use of first and second person pronouns (e.g. 'us'/'you'), using more day-to-day words in place of more technical ones, and a few other techniques.

TIMELY - target the right moment

Make future cost savings feel more immediate: One major barrier to investment in green technology is the tendency to focus on present costs and de-emphasise future savings. BIT found that displaying the lifetime running costs next to the price tag of washer dryers to help overcome that present bias, and it shifted consumer purchases slightly towards more energy-efficient appliances. (DECC, 2014).

Provide information when it is most relevant to the consumer: Providing information to consumers when it is most relevant to them appears to improve comprehension. The Financial Conduct Authority (FCA) found that presenting an asset management charges summary and comparison chart on a 'review screen' right before investors finalized their selection improved understanding more than placing the comparison chart on fund-specific pages that investors browsed while making their decision. in order to improve, investors' understanding of the charges (FCA, 2018).

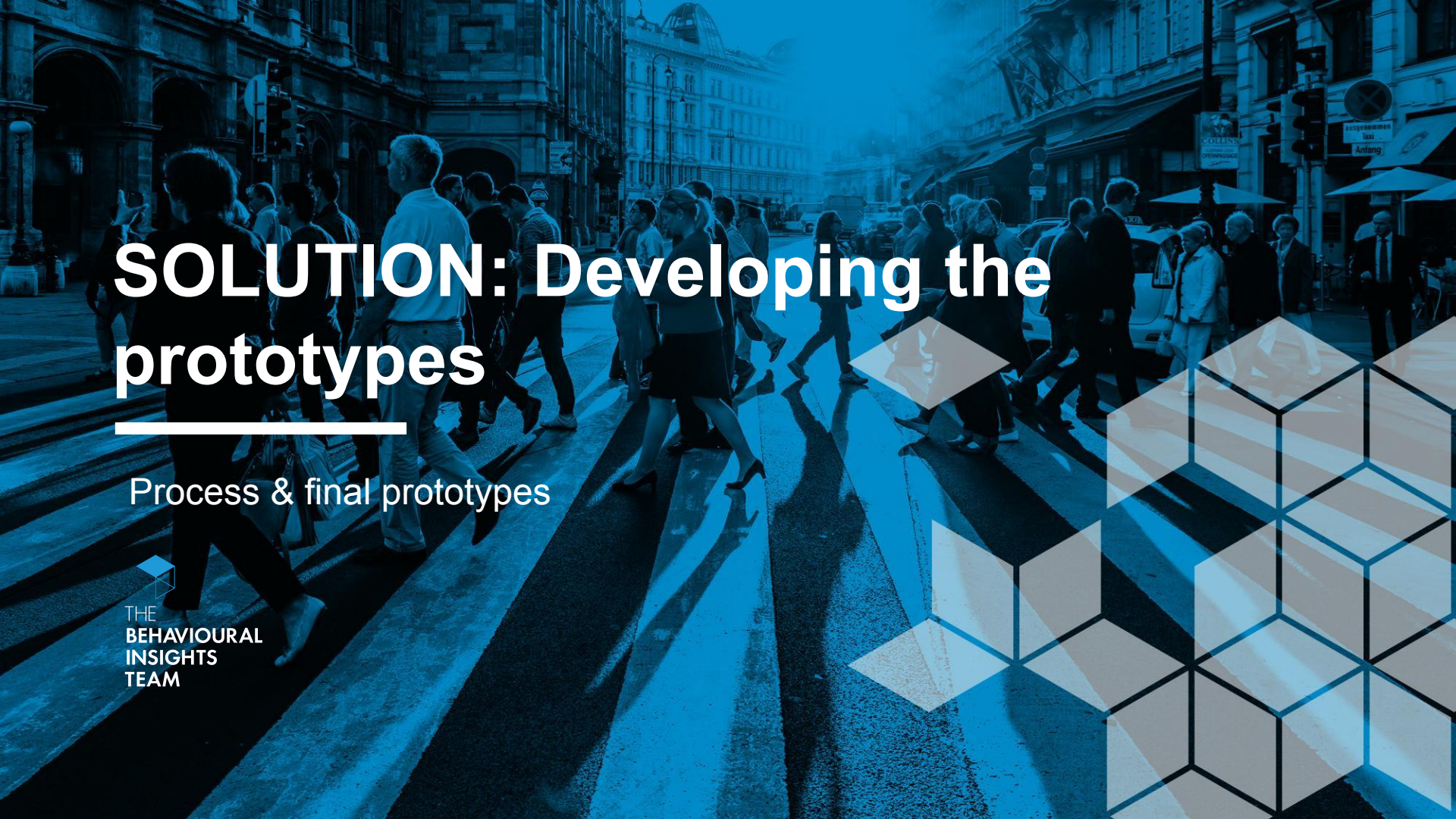
Summary of findings from the evidence review: Improving trust

Website professionalism: Website design influences customers' trust in an organisation or company. Seckler et al. (2015) found that distrustful user experiences online are mostly an effect of graphical and structural design issues of a website. Lowry, Wilson, and Haig (2013) demonstrated that logos and websites with specific features that invoke trustworthiness—such as consistency, stable shapes, simplicity, contemporariness, and reassuring colours—increased perceived trustworthiness of the organisation represented by a website.

De-emphasize offers: Researchers found that providing consumers with offers or explanations of better deals available sometimes caused suspicion among consumers.

Simplification & relatability: Making information easier to understand and more 'relatable' can increase levels of self-reported trust.(Bholat, D. et al., 2018)

Messengers: The literature shows that the type of messengers that are considered 'trusted' depends significantly on the audience and context (Moser, 2010). Experts typically have a high degree of influence (Wilson & Sherrel, 1993), but are not the most trusted or most appropriate source with every audience or message (Moser, 2010). Familiarity with the messenger is important. (Ofgem, 2017). Finally, people trust information that comes from their own social network. (Moser 2010)



SOLUTION: Developing the prototypes

Process & final prototypes

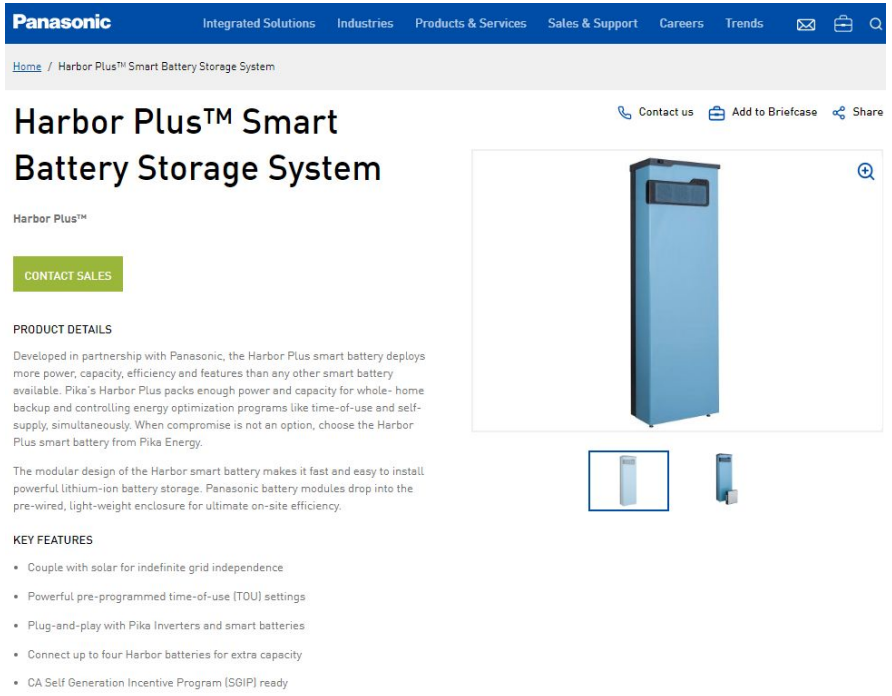
THE
BEHAVIOURAL
INSIGHTS
TEAM

What does information provision currently look like - Panasonic

In order to develop ideas for how to *improve* comprehension, the first step was to look at what information provision currently looks like and construct a 'business as usual' information scenario to serve as the baseline. For this, we reviewed websites of various smart battery storage manufacturers:

Panasonic, for instance, uses very technical language throughout and doesn't fully describe the different uses and benefits as such. For instance, it describes the battery as having *"good enough power and capacity for whole-home backup and controlling energy optimization programs."* This contains no information about the requirements to optimally use the battery. It's also not clear what 'whole-home backup' or 'energy optimization programs' exactly refer to and what that might mean in terms of energy costs.

It lists 'key features', which indicate it can be paired with solar panels and that consumers benefits from powerful time-of-use settings, but this information is implicit only and again there is nothing about the actual technical requirements needed to use the battery.


Panasonic
Integrated Solutions
Industries
Products & Services
Sales & Support
Careers
Trends
Home / Harbor Plus™ Smart Battery Storage System
Harbor Plus™ Smart Battery Storage System
Contact us
Add to Briefcase
Share
Harbor Plus™
CONTACT SALES
PRODUCT DETAILS
Developed in partnership with Panasonic, the Harbor Plus smart battery deploys more power, capacity, efficiency and features than any other smart battery available. Pika's Harbor Plus packs enough power and capacity for whole- home backup and controlling energy optimization programs like time-of-use and self-supply, simultaneously. When compromise is not an option, choose the Harbor Plus smart battery from Pika Energy.
The modular design of the Harbor smart battery makes it fast and easy to install powerful lithium-ion battery storage. Panasonic battery modules drop into the pre-wired, light-weight enclosure for ultimate on-site efficiency.
KEY FEATURES
Couple with solar for indefinite grid independence
Powerful pre-programmed time-of-use (TOU) settings
Plug-and-play with Pika Inverters and smart batteries
Connect up to four Harbor batteries for extra capacity
CA Self Generation Incentive Program (SGIP) ready

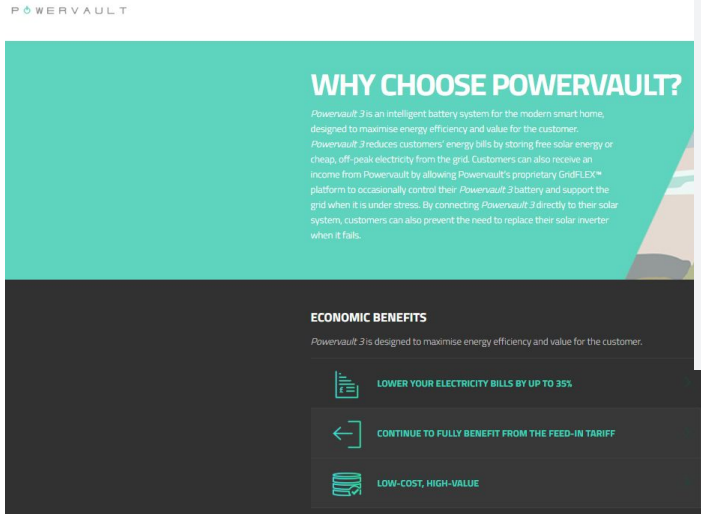
Source: Screenshot was taken from pika-energy.com. This particular product page has been taken down since.

What does information provision currently look like - Moixa and Powervault

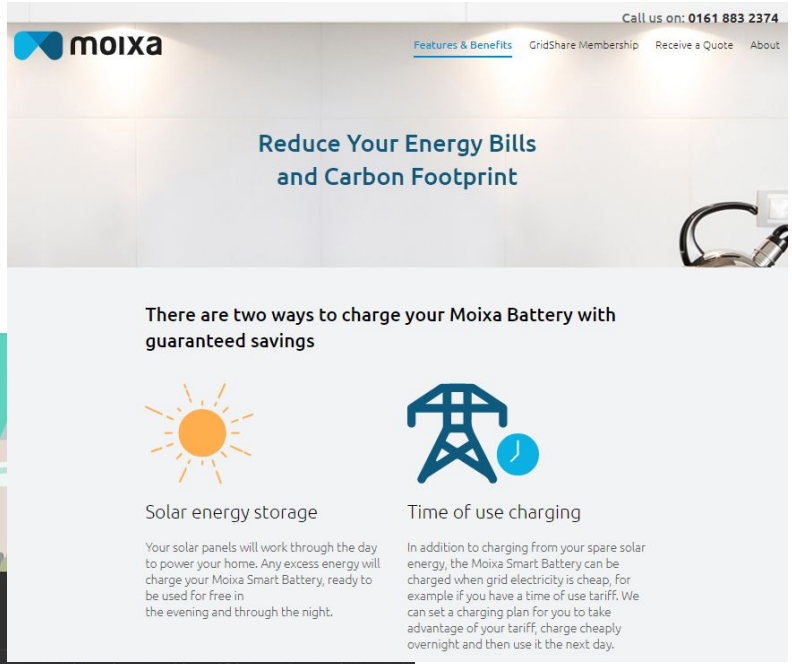
Moixa and Powervault are much more elaborate in their communication than Panasonic. They both list some of the different use cases and explain their benefits well, although Powervault is talking about the benefits from solar energy only with regards to the feed-in-tariff consumers with panels might receive.

Neither explicitly list technical requirements. Powervault even provides an estimate of potential energy bill savings but doesn't sufficiently outline under what conditions that might occur.

These types of estimates are risky as they depend on many factors that are unique to each household.


POWERVAULT
WHY CHOOSE POWERVAULT?
Powervault 3 is an intelligent battery system for the modern smart home, designed to maximise energy efficiency and value for the customer. Powervault 3 reduces customers' energy bills by storing free solar energy or cheap, off-peak electricity from the grid. Customers can also receive an income from Powervault by allowing Powervault's proprietary GridFLEX™ platform to occasionally control their Powervault 3 battery and support the grid when it is under stress. By connecting Powervault 3 directly to their solar system, customers can also prevent the need to replace their solar inverter when it fails.
ECONOMIC BENEFITS
Powervault 3 is designed to maximise energy efficiency and value for the customer.
LOWER YOUR ELECTRICITY BILLS BY UP TO 35%
CONTINUE TO FULLY BENEFIT FROM THE FEED-IN TARIFF
LOW-COST, HIGH-VALUE

Powervault:
https://www.powervault.co.uk/powervault-to-store-your-solar-energy/,
Screenshot taken in September 2019


Call us on: 0161 883 2374
moixa
Features & Benefits
GridShare Membership
Receive a Quote
About
Reduce Your Energy Bills and Carbon Footprint
There are two ways to charge your Moixa Battery with guaranteed savings
Solar energy storage
Your solar panels will work through the day to power your home. Any excess energy will charge your Moixa Smart Battery, ready to be used for free in the evening and through the night.
Time of use charging
In addition to charging from your spare solar energy, the Moixa Smart Battery can be charged when grid electricity is cheap, for example if you have a time of use tariff. We can set a charging plan for you to take advantage of your tariff, charge cheaply overnight and then use it the next day.
Powervault 3 can reduce customers' electricity bills by up to 20% by storing solar energy during the day and discharging it in the evening. Powervault 3 can also charge from the grid, which means it can store cheap, off-peak electricity. Customers on 'smart' time-of-use tariffs can save an additional 15% on their energy bills by storing low-cost electricity and discharging it at peak time. Powervault 3 is compatible with Economy 7 tariffs and Green Energy UK's . Powervault 3 is forward-compatible with other 'smart' tariffs, which are forecast to become widespread once smart meters are installed.

Moixa:
https://www.moixa.com/solar-battery/features-benefits/,
Screenshot taken in September 2019

What does information provision currently look like - Moixa

Moixa talks about the access to and benefits of flexibility services in a different tab (orange circle) separate to the other two use cases mentioned under the tab “features & benefits”.

The way the information is structured and framed implies that the ‘benefits’ are primarily related to solar and the use of a TOU tariff. It’s perhaps the right choice to downgrade flexibility services as a potential secondary benefit given the early stages of the flexibility service market. However, for the purposes of our experiment, we put the same emphasis on all three benefits in anticipation of what information provision will have to achieve as markets mature.

We also note, however, that despite devoting an entire page to flexibility services, Moixa (or any of the other manufacturers) doesn’t sufficiently address that there is a direct financial trade-off in benefiting from a flexibility service and the other two uses of battery storage, i.e. optimising solar energy use and harnessing the benefits of a TOU tariff.

What is GridShare?

GridShare is the software that puts the ‘smart’ in every Moixa Smart Battery. GridShare identifies a home’s energy generation and consumption patterns, looks at weather forecasts and reviews the home’s energy tariff.

Then, based on all the data points, GridShare generates a personalised battery charging plan for your household’s needs.

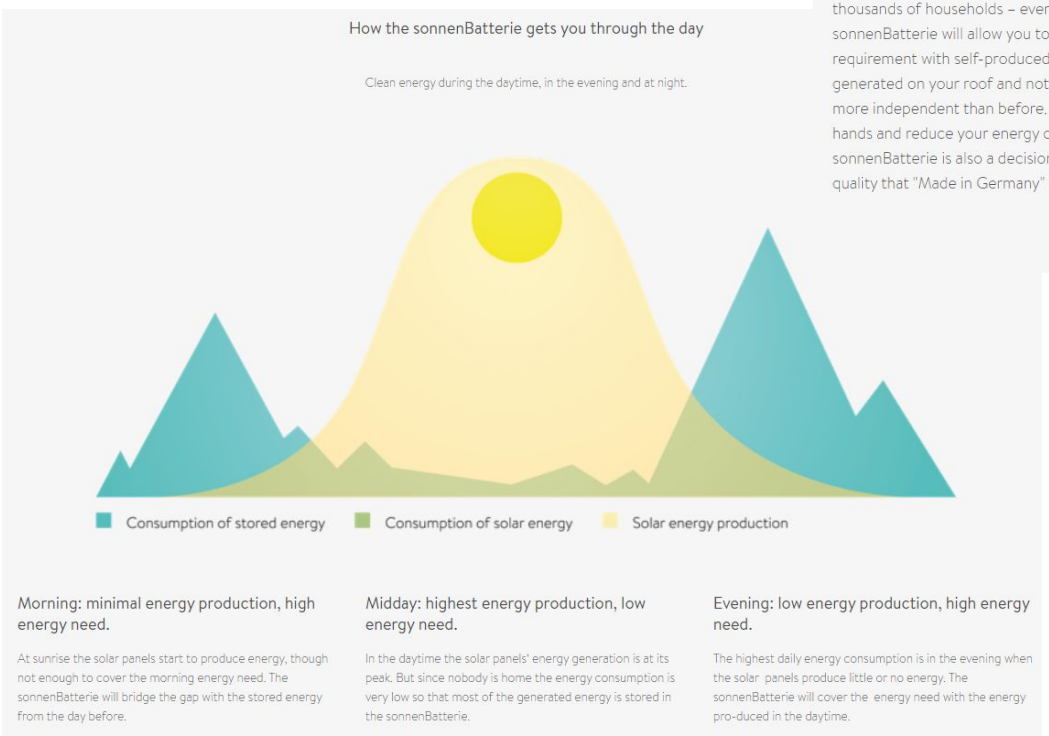
With GridShare, there is also the option to unlock your battery to provide energy services to support the grid and enable a new era of sustainable energy in the UK. Every Moixa Smart Battery owner has the option to take part in this and we call it GridShare Membership.

Source: https://www.moixa.com/solar-battery/gridshare-membership/, Screenshot taken in September 2019

What does information provision currently look like - Sonnenbatterie

Sonnenbatterie doesn't list different use cases, and the branding implies use with solar panels, and provides an illustration for how storage and solar generation work together effectively to reduce the consumers' energy bills and reliance on energy suppliers. Similarly to Powervault it provides an estimate of yearly energy cost savings (75%) if used with solar panels but it doesn't provide any parameters for this scenario or explicitly list requirements.

Like Moixa, Sonnenbatterie addresses flexibility services in a separate tab (here).


SONNENBATTERIE
Intelligent, long-lasting and economical – the sonnenBatterie
The sonnenBatterie is a high-tech storage system that has proven itself in thousands of households – every day. The combination of a PV system and a sonnenBatterie will allow you to cover about 75% of your yearly energy requirement with self-produced and clean energy. Since your energy is being generated on your roof and not by some anonymous energy provider you are more independent than before. So take your energy future into your own hands and reduce your energy costs to a minimum. The decision for a sonnenBatterie is also a decision for the highest standards in safety and quality that "Made in Germany" stands for.
How the sonnenBatterie gets you through the day
Clean energy during the daytime, in the evening and at night.
Consumption of stored energy
Consumption of solar energy
Solar energy production
Morning: minimal energy production, high energy need.
At sunrise the solar panels start to produce energy, though not enough to cover the morning energy need. The sonnenBatterie will bridge the gap with the stored energy from the day before.
Midday: highest energy production, low energy need.
In the daytime the solar panels' energy generation is at its peak. But since nobody is home the energy consumption is very low so that most of the generated energy is stored in the sonnenBatterie.
Evening: low energy production, high energy need.
The highest daily energy consumption is in the evening when the solar panels produce little or no energy. The sonnenBatterie will cover the energy need with the energy pro-duced in the daytime.

Source: https://sonnenbatterie.co.uk/sonnenbatterie/ , Screenshot taken in September 2019

Developing the control condition

Developing the ‘control condition’

Having reviewed these companies and the way they talk about smart battery storage on their websites, we developed the ‘control condition’ for this research, which acted as the baseline level and quality of information provision for this research.

To be able to compare ‘like for like’, we wanted to ensure that all interventions, including the control, contained all the ‘necessary information’ on smart battery storage. In this way, we compare the effect of different styles, phrasings and formats on comprehension, rather than the impact of including or excluding certain information.

Therefore, we included a **‘summary paragraph’** which describes the three uses cases, their benefits, the trade-off as well as the three technical requirements. It doesn’t provide a detailed explanation of how the benefits work, how they relate to the technical requirements or what the trade-offs are. But It was designed to enable to savvy consumers who attentively engaged with the material to understand what we aim to communicate in this experiment. The prototypes (treatment conditions) were then designed to make it possible for less savvy, mainstream consumers to understand these elements, too.

Apart from that summary paragraph, the control condition both in terms of **content and format** resembles the level and quality of the weaker ‘business as usual’ manufacturer communications.

It provides minimal information on the use cases and functionality of the battery or an account of the requirements and parameters to operate the device and harness its full potential. For most consumers, we hypothesise that the control condition will be insufficient to provide a comprehension understanding of the benefits and requirements of smart battery storage. We framed the information in all conditions around a fictional smart battery storage system called Battery X.

Battery X - green living with intelligent battery storage

Battery X is a smart battery storage system. **Battery X** can help you reduce your electricity bills by storing electricity from your supplier when it’s cheaper during off-peak times or by storing energy from your solar panels. As well as saving on your bills, **Battery X** can help you make money by letting an energy company use your **Battery X** to store or release electricity when the electricity system needs it. **Battery X** can store up to 6 kWh of energy - that’s enough to power your kitchen appliances and TV for one evening as well as a laptop all day.

Note, to use **Battery X**, you’ll need to have a smart meter and somewhere cool and dry to store it.

Battery X is a modular system so you can upgrade to **Battery X premium** any time for more capacity and performance. **Battery X** is built according to industry-recognised safety standards and can be setup by a technician.

Product details:

- Attach to solar to optimise your solar investment
- Use with time-of-use (TOU) tariff
- Modular system
- Access to grid balancing services

Developing the prototypes

Designing prototypes that can improve comprehension: 9 initial options (A-E)

To develop the prototypes we drew heavily on the findings from the evidence review as well as our in-house expertise. In the first instance, we developed and mocked-up a number of prototype ideas and subsequently prioritised three of these in collaboration with Citizens Advice and other stakeholders.

We provide an overview of the nine initial ideas for prototypes with a brief explanation as to their content and format, as well as the behavioural rationale underpinning them:

A: Chunking & additional information on benefits: 'Chunking' means to break up text into bite-sized pieces of information, for example through the use of sub-titles and paragraphs. For P1, we added more detailed explanations for each of the use cases, their benefits to the consumer and the related technical requirements, and laid these out in well structured paragraphs with appropriate subtitles.

B: P1 + requirement call-out-box: P2 is the same as P1 but also has a salient, orange call-out box at the bottom that lists the three technical requirements as bullet points, in response to a headline saying "Read before buying". Such call-out boxes are effective at drawing in attention, and bullet points are an effective format to communicate a list of items.

C: P1 + icons to illustrate benefits: P3 is the same as P1 but each paragraph is accompanied by an icon as a visual representation of its content. Visuals are very effective at communicating complex pieces of information and at making information stick.

D: P1 + short risk warning: P4 adds a short risk warning to the information contained in P1. Short risk warnings such as "CAUTION HOT!" are popular tools among regulators and industry to hand over responsibility to the consumer to know what they're doing. However, the evidence on risk warnings is mixed.

E: P1 + long risk warning: Evidence suggests that risk warnings are actually most effective when *"products cause high impact, high probability harm, especially when this is not well known. But when they are used indiscriminately and intensely, they may have the potential to backfire."* (https://www.fca.org.uk/insight/dont-look-here-do-risk-warnings-really-work)

Based on these findings, we developed a longer, more detailed risk warning that provided consumers more information about what the elements the level of risk dependent upon.

Designing prototypes that can improve comprehension: 9 options (F-I) & prioritisation

F: FAQ format: P6 Contains the same information as P1 but instead of subtitles, it reformats the information and paragraphs into a typical 'frequently asked questions' format, where each paragraph is introduced through a question and the answer addresses the reader directly using the personal pronoun 'you'. We found this to be effective

G: Checklist format/ triage tool: Checklists are often effective decision-tools. We used them here to frame the information(in particular the requirements) in way that allows readers to decide more effectively if smart battery storage is right for them.

H: 3 levels of benefits: We wanted to illustrate the level of potential benefits and the related requirements by outlining scenarios of 'no benefit', 'some benefit' and 'full benefit'. The intention was that the scenarios would make the information more actionable and relatable but we found it hard to make these accurate and generalisable.

I: Visualising trade-off between the use modes: We added icons for the different use cases and placed them next to an illustration of a battery with different imaginary 'sections' for each use mode, visualising the trade-off in benefits between them.

Choosing the final three prototypes: Subsequently, we prioritised these nine options based on a number of different factors, including the likelihood of impact on comprehension, relevance for regulatory policy, and transferability (the ease with which these principles are transferable to other smart home technology markets).

One of the prototypes (P1) focused on using text-only to structure and summarise the benefits, the tradeoff and the requirements in a logical order, using simple terminology. We therefore chose the FAQ format for the first prototype (P1) , as it combines the benefits of 'chunking' (option A) with the more engaging format of the FAQ (option F).

For the second prototype (P2), we were interested in developing useful insights for regulators on whether or not risk warnings were effective in this space. As existing evidence for short risk warnings was weak, we opted to add a more detailed risk warning to the FAQ format (P2 was a combination of option F and option E).

Finally, the third prototype (P3) was designed for maximum impact. We wanted to make the different use cases and respective benefits easier to understand and more memorable through the use of icons. The relationship between the requirements and the benefits was highlighted through the use of a triage tool (option G), and the financial trade-off between benefits (in particular the flexibility service) was illustrated through the use of a red line, visually separating the battery's capacity (option I).

The subsequent slides explains the rationale for the final prototypes in more detail.

The three finalists

P1: FAQ format

This prototype includes the summary paragraph and three more paragraphs - two for the financial benefits and their related requirements and one on the environmental benefit. The second paragraph states the trade-off between earning an income and reducing one's electricity bill, and the final paragraph outlines the mechanisms behind the environmental benefit.

Behavioural insight: This way of disclosing the information was expected to engage the reader with the content. The FAQ format also helps to structure the information in paragraphs that contain bite-sized information that is more easily digestible and might preempt the readers' thoughts and the answers directly address the reader with 'you'.

(P1 is equivalent to option F).

P2: P1 (FAQ) + long risk warning

The second prototype builds from the first. It uses the exact same text as P1 and in addition includes an orange, salient call-out box at the bottom that voices a (long) risk warning about the product. It explicitly states that buying smart battery storage is not for everybody and lists a number of elements, consumers need to collect information before they're able to assess (through a cost-benefit analysis) whether their household would benefit from investing in smart battery storage.

Behavioural insight: There is some evidence to suggest that longer risk warnings for complex and less well-known risks tends can be effective. We wanted to test if that was applicable in the context of smart battery storage.

As P1 and P2 only differ in that P2 includes the risk warning, we will be able to draw direct comparisons between these two prototypes.

(P2 is a combination of options E and F).

P3: Triage tool + trade-off visuals

The final prototypes is the longest. It contains two parts that were shown beneath each other. The first part is labelled as a 'triage tool', i.e. a tool to enable consumers to assess easily if this product is for them. It does that by asking two questions: one about requirements that are indispensable and another one requirements conditional on the use mode or benefit.

Behavioural insight: 'Decision tools' like this one are popular to break complex decision processes down into easy, small steps. Making things easy is one of the key drivers of comprehension and behaviour change.

The second part is a set of visuals that aims to illustrate the financial trade-off between the different use modes, in particular the loss of capacity related to signing up with a flexibility service. We also use icons and colours to illustrate each use mode.

Behavioural insight: Visuals are effective in communicating complex information in a salient and memorable way.

(P3 is a combination of options G and I).

P1: FAQ format

Battery X - green living with intelligent battery storage

Battery X is a smart battery storage system. **Battery X** can help you reduce your electricity bills by storing electricity from your supplier when it's cheaper during off-peak times or by storing energy from your solar panels. As well as saving on your bills, **Battery X** can help you make money by letting an energy company use your **Battery X** to store or release electricity when the electricity system needs it. **Battery X** can store up to 6 kWh of energy - that's enough to power your kitchen appliances and TV for one evening as well as a laptop all day.

Note, to use **Battery X**, you'll need to have a smart meter and somewhere cool and dry to store it.

How can Battery X help me reduce my electricity bill?

- First, you can store electricity directly from your energy supplier at times when it's cheaper, and then use it whenever you need it. Note, you'll need a 'time of use' tariff for this. A 'time of use' tariff is a tariff where the price varies at different times, e.g. it may be cheaper to use electricity at night and more expensive during the hours of the day when demand is high.
- Second, if you have solar panels you can store unused energy when it's being generated, and use it when you need it, for example when the sun isn't shining.

How can Battery X help me generate an income? To help the electricity system at busy times, you can sign up with an energy company who will pay you an income to lend part, or all of your **Battery X**'s storage capacity. Note, this may mean you cannot use this share of your battery for your own energy storage. This also means there is a financial trade-off between this income and the other benefits summarised above.

How can Battery X make my energy consumption greener? Battery X allows you to store electricity generated from your solar panels to use later. It can also help the entire system by storing renewable energy for the national grid at busy times or releasing electricity when it's needed. You can also set your **Battery X** to store electricity from the national grid when it is greenest.

P2: FAQ format + long risk warning

Battery X - green living with intelligent battery storage

Battery X is a smart battery storage system. **Battery X** can help you reduce your electricity bills by storing electricity from your supplier when it's cheaper during off-peak times or by storing energy from your solar panels. As well as saving on your bills, **Battery X** can help you make money by letting an energy company use your **Battery X** to store or release electricity when the electricity system needs it. **Battery X** can store up to 6 kWh of energy - that's enough to power your kitchen appliances and TV for one evening as well as a laptop all day.

Note, to use **Battery X**, you'll need to have a smart meter and somewhere cool and dry to store it.

How can Battery X help me reduce my electricity bill?

- First, you can store electricity directly from your energy supplier at times when it's cheaper, and then use it whenever you need it. Note, you'll need a 'time of use' tariff for this. A 'time of use' tariff is a tariff where the price varies at different times, e.g. it may be cheaper to use electricity at night and more expensive during the hours of the day when demand is high.
- Second, if you have solar panels you can store unused energy when it's being generated, and use it when you need it, for example when the sun isn't shining.

How can Battery X help me generate an income? To help the electricity system at busy times, you can sign up with an energy company who will pay you an income to lend part, or all of your **Battery X**'s storage capacity. Note, this may mean you cannot use this share of your battery for your own energy storage. This also means there is a financial trade-off between this income and the other benefits summarised above.

How can Battery X make my energy consumption greener? Battery X allows you to store electricity generated from your solar panels to use later. It can also help the entire system by storing renewable energy for the national grid at busy times or releasing electricity when it's needed. You can also set your **Battery X** to store electricity from the national grid when it is greenest.

CAUTION

Smart storage batteries require an upfront investment that is not worthwhile for all households. The calculations surrounding this can be complex – involving your current solar generation, grid consumption, devices in your home, and your energy lifestyle.

P3: Triage tool + trade-off visuals (2 subsequent slides)

Battery X - green living with intelligent battery storage

Battery X is a smart battery storage system. **Battery X** can help you reduce your electricity bills by storing electricity from your supplier when it's cheaper during off-peak times or by storing energy from your solar panels. As well as saving on your bills, **Battery X** can help you make money by letting an energy company use your **Battery X** to store or release electricity when the electricity system needs it. **Battery X** can store up to 6 kWh of energy - that's enough to power your kitchen appliances and TV for one evening as well as a laptop all day.

Step-by-step guidance:

1. **Is smart battery storage right for me?**

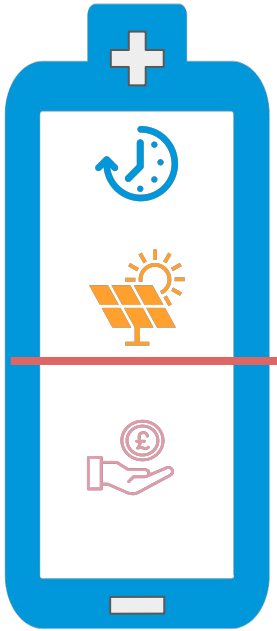
   Yes, if you:

   - ☑ Have a smart meter, and
   - ☑ Have a cool and dry place to install it

2. **Have you considered how you want to use Battery X? Smart battery storage is designed for a few different uses. In order to benefit from having one, you would need to have at least one of the following:**

   - ☑ A time of use tariff to store cheap electricity from your supplier. A 'time of use' tariff is a tariff where the price varies at different times, e.g. it may be cheaper to use electricity at night and more expensive during the hours of the day when demand is high.
   - ☑ Solar panels to store solar energy
   - ☑ Sign up to lend part or all of your Battery X's capacity to an energy company

You can use and benefit from y*our Battery X* in different ways:



Cheaper energy from your supplier. Reduce your energy bill by storing electricity directly from your energy supplier at times when it's cheaper, and then using it whenever you need it.

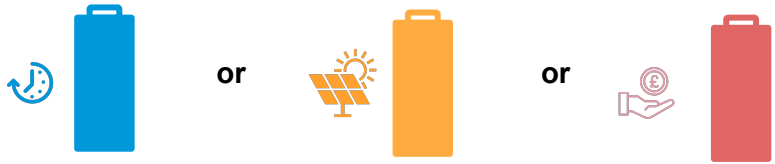
Solar energy. If you have solar panels you can store unused energy when it's being generated, and use it when you need it, for example when the sun isn't shining.

Capacity share lent to supplier in return for income. To help the electricity system at busy times, you can sign up with an energy company who will pay you an income to lend part, or all of your **Battery X**'s storage capacity. Note, this may mean you cannot use this share of your battery for your own energy storage. This also means there is a financial trade-off between this income and the other benefits summarised above.

Battery X can help reduce CO2 emissions, as it enables the national grid to use renewable energy sources more efficiently, and it allows you to use more electricity generated from your solar panels.

And you can combine your benefits in three different ways:

A - single use: Use your battery's full capacity for **one** of the three benefits.



B - dual use: Split your storage capacity between **two** benefits.

C - combined: Split your capacity between all three benefits.

The Trustmark

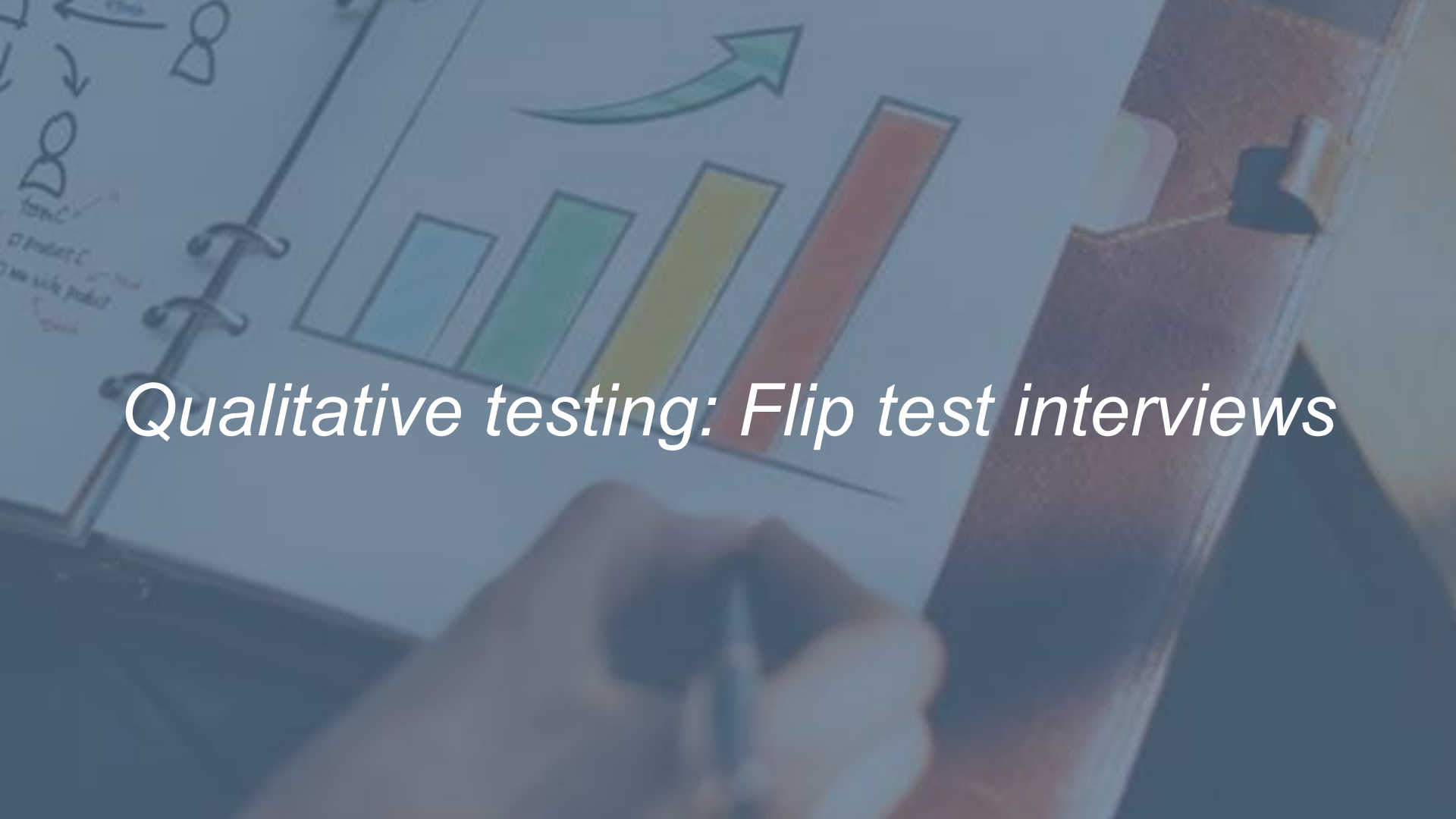
Both the control and all prototypes were used with and without the **Trustmark**, as shown on the right. As described on their website, this "*TrustMark is the Government Endorsed Quality Scheme covering work a consumer chooses to have carried out in or around their home. When a consumer uses a TrustMark Registered Business, they know they are engaging an organisation that has been thoroughly vetted to meet required standards, and has made a considerable commitment to good customer service, technical competence and trading practices. By ensuring all Registered Business adhere to and maintain these standards through our expert network of Scheme Providers, TrustMark gives consumers increased confidence and choice. Additionally, in the event that a problem does arise, TrustMark offers a range of remedies to give further protection to consumers.*"

Kitemarks like this one are commonly used to increase consumer confidence and guide them to good-quality products but there is often a lack of evidence about how consumers actually perceive and value different kitemarks in different contexts. We wanted to look at whether the Trustmark increased consumers' trust in manufacturers of smart battery storage.
In this report, we display the prototypes without one but we have included those with a trustmark in Appendix C.

TRIAL: Qualitative and quantitative testing

Methodology & results

THE BEHAVIOURAL INSIGHTS TEAM



Qualitative testing: Flip test interviews

Approach and sample

We conducted six in-depth, in-person interviews with consumers in vulnerable circumstances s. We showed each participants one of the three prototypes and subsequently asked questions exploring their level of comprehension of the benefits and requirements of smart battery storage. The purpose of the interviews was to understand how these consumers engage with and process the information shown in the prototypes, and also to understand whether there are elements where comprehension among consumers in vulnerable circumstances significantly differs from that of the general population.

We sampled the six interviewees given the following recruitment specification:

- All were from low income households
- One participant was visually impaired and used assistive technology to access their computers
- Two participants were not/ less digitally confident
- Three participants from urban areas, three from suburban/ rural areas within the Greater London Area
- Three participant lived in social housing renters, one rented from a private landlord and one was a house owners
- One participants who was engaged with the energy market, (switched supplier or tariff during the last 12 months), two participants who switched between 1-2 years ago, and two who are disengaged (i.e. have not switched supplier or tariff over the last two year).

We also used the interviews to ‘stress test’ the prototypes, and make minor changes to the wording in some places as a response. For example, one interviewee found the word ‘rent’ very helpful to explain how one could earn an income from signing up to a flexibility service - so we changed the language in all prototypes using the word ‘rent’. The changes we were able to do were quite minor and are therefore not explained in any detail.

Each prototype was seen by two interviewees. Interviewee 1 & 2 saw P3 (triage tool+ trade-off visual), interview 3 & 6 saw P1 (FAQ), and interviewee 4 & 5 saw P2 (FAQ + risk warning).

The discussion guide used during the interviews can be found in Annex D.

Key findings by theme & prototype

Awareness of smart batteries

None of the people interviewed had heard about smart batteries before the interview. When asked whether they knew what a smart battery was, some asked whether it was the same as a smart meter. Only interviewee 4 had a guess at what he thought a smart battery was: "*a smart battery is holding the energy in and then releasing it, but I know nothing about it. I haven't heard of it*."

Reactions to the prototypes: Prototype 1 (FAQ)

Understanding: Both respondents appeared to understand that they could store energy when it is cheaper and use it when the energy would otherwise be more expensive.

"*It's taking the cheaper rate usage and holding it and then you are not paying as much obviously… storing it and use it when you want, and obviously, when the tariffs are higher you can use the lower tariff, yes that makes sense*." (Interviewee 3)

They were also clear that the smart battery could be used to store energy from solar panels.

In contrast, they both misunderstood, in different ways, how someone could generate income from a smart battery. Although this did not make sense to her, interviewee 3 thought that the energy supplier would pay her if she used her smart battery when the system was under stress: "*When it says it will pay you an income, so my energy supplier will pay me to use it, is that what it reads?*" Interviewee 6, on the other hand, had a different interpretation: "*it can be an income provider because the energy suppliers may want to buy the stored energy from you…. It says that the suppliers may be interested in buying some of the stored energy*".

Interviewee 6 remarked that the interviewer's explanation which talked about the energy supplier 'renting' the storage space was clearer: "*So they are not buying (energy) from me but paying me to use (the storage)?... When you use the word 'rent', that's a good way (of explaining it)*."

Requirements: Whilst interviewee 6 had understood that there were three key requirements for having a smart battery, interviewee 3 only recalled the need for a smart meter initially.

Key findings by theme & prototype

Understanding of key terms: Neither respondent had come across the term ‘time of use tariff’ before. Interviewee 3 assumed it referred to the time when she might use electricity the most, whereas interviewee 6 thought it might be about knowing when electricity is cheaper to use. They both understood ‘off peak’ as being the less busy period.

Both understood ‘kwh’ as referring to ‘kilowatts’, rather than ‘kilowatt hour’. They both appeared to be familiar with this term from their energy bills. Interviewee 6 added that she thought that, without the example provided, the reference to ‘6 kwh’ would have been meaningless to her.

Views on smart batteries: Both liked the idea of smart batteries, especially the idea of saving money on energy bills. Interviewee 6 said “*it sounds really cool. I mean it seems really innovative… if it can help you use energy more efficiently where it’s cheaper, it’s really interesting*.”

Interviewee 6 said that having to have a smart meter in order to have a smart battery would not put her off getting one in future.

Reactions to the prototypes: Prototype 2 (FAQ+ risk warning)

Understanding: Interviewee 5 immediately understood how he could benefit from cheaper energy from the first reading: “*Directly from the energy supplier when it’s cheaper and it gives an example of it might be cheaper using the electricity at night and that’s at a time when not a lot of people use electricity. You save money by storing when it’s cheaper*.” In contrast, interviewee 4 initially assumed that one would need to have solar panels in order to use a smart batter but after a second reading he realised that the energy could also come directly from the energy supplier.

Like the two respondents who viewed Treatment T1 above, interviewee 4 misunderstood how he could generate income from the smart battery. Interviewee 5, in contrast, appeared to understand how the energy company might want to use the storage capacity from the start: “*so my supplier who I’m with will pay me… From what I’ve read it’s basically saving energy to your battery… That’s their energy from the supplier… It’s not for me, it’s their energy*.”

Key findings by theme & prototype

Interestingly, despite there being no detailed information in this treatment about how the battery could be shared for different uses, interviewee 4 suspected it would probably be possible to use the battery for different purposes at the same time: "*It says this means you cannot use the share of your battery for your own use, so does that mean there are two parts to the battery? One part which you are using, and another part which is storage that the National Grid or whoever is using*?"

Finally, interviewee 5 remarked that he did not understand how energy could be at its 'greenest', and felt that needed more explanation.

Risks: Both respondents understood that an 'upfront investment' referred to the set-up costs of the battery but the 'worthwhile' reference was not fully clear to both of them. Interviewee 4 assumed that whether the investment was worthwhile would depend on people's electricity consumption, the devices they had and their lifestyle. He expected that people could fill in some sort of questionnaire, in advance, to determine whether it would be worthwhile.

Requirements: In terms of the requirements for a smart battery, interviewee 4 recalled the need for a smart meter straightaway, presumably because he doesn't have a smart meter and also recalled that it would need to be stored somewhere cool and dry. However, he only picked up on the need for a 'time of use tariff' when he was asked to re-read the treatment. Furthermore, it appeared that he had misunderstood the reference to being able to switch tariff. He seemed to think that he would be able to switch between tariffs as he needed to. For example, switching between one tariff for when people are at home and another for when they are away. Once this was explained to him correctly, he felt that it needed to be made clearer.

In contrast, interviewee 5 picked up on the 'time of use tariff' first, and only picked up on the other two after re-reading the information.

Understanding of key terms: Interviewee 5 understood what 'time of use tariff' meant. Interviewee 4's understanding was that it meant "*certain parts of the day when the system is overused, say at 6 o'clock or 8 o'clock, and if it's 1 o'clock in the afternoon there is less usage because people are out…*" They both understood that 'off peak' to mean times when energy would be cheaper.

Key findings by theme & prototype

Views on smart batteries:Interviewee 4 really liked the idea of a smart battery, as it could save him money or generate him an income, and the fact that it could help the environment was also appealing.

Interviewee 5 on the other hand, did not think that a smart battery would benefit him at the present time, but wondered whether he might look into getting one if his energy bills were higher when he moved to somewhere bigger in the future.

Reactions to the prototypes: Prototype 3 (triage tool + trade-off visual)

Understanding: Interviewee 1 understood that a smart battery would allow her to store energy when it is cheaper and then use it when otherwise it would be more expensive. Interviewee 2 was also aware that cheaper energy could be stored on the battery but she appeared to think that cheaper energy was only available at certain times of the year, rather than on a daily basis. Her thinking led her to see the point of the battery as being able to store energy that could be used in the event of a power cut, which she saw as an advantage.

As with some of the other respondents, the idea of being able to generate an income from a smart battery was misunderstood. Both seemed to think that they would be paid to sell their stored energy back to the supplier.

Both understood that the battery could also be used to store energy generated from solar panels. Being able to use the battery for different uses was clear to interviewee 2, but less so to interviewee 1. The latter was under the impression that if her battery was being used by the energy supplier - when she thought that they would be buying back the energy from her - she would have no access to electricity at all.

Requirements: Both were clear on what the three requirements were. This is probably because they are presented in three bullet points.

Understanding of key terms: Both respondents understood 'off peak' to mean cheaper energy. However, they were not clear on what a 'time of use tariff' was. Interviewee 2 had no idea what it was, and interviewee 1 thought it was "*when you are setting your hot water to come on or heating to come on, so that's what I imagine it would be*."

Interviewee 1 understood that 'kwh' referred to 'kilowatt hour', whereas interviewee 2 thought it just referred to 'kilowatts'.

Key findings by theme & prototype

Views on smart batteries: Both really liked the idea of smart batteries. Interviewee 2 particularly liked the idea that she could store energy to be used in the event of a power cut.

Getting Information: All interviewees were asked generic questions about how they usually go about researching a new purchase

Information required: When asked what information they would require when purchasing a new home appliance or piece of technology, the following things came up most: cost to buy, specifications / capacity and brand were key considerations, but also how economical an appliance was to run, and whether the brand / manufacturer was environmentally friendly were also important to some.

Sources of information: All of those interviewed talked about how they would do some initial research online, typically looking for product reviews. Some looked for reviews by other customers in terms of what they thought about quality, cost and customer service, whereas others looked for independent expert reviews.

The respondents in this study mostly searched for reviews through Google, rather than going directly to specific review sites

Most respondents were aware of various review, advice and comparison websites like Which, Citizens Advice, Money Saving Expert, Go Compare etc. but didn't see them as relevant for choosing appliances and new technology. They saw the Citizens Advice as somewhere they would go for legal advice, and sites like Money Saving Expert for switching energy suppliers or bank account.

After the online research, some respondents would typically go into stores to ask more questions, to get a feel for the product in terms of size and weight etc and make their purchase.

Some also asked friends and family for recommendations, but where the product was seen as very technical, such as a smartphone, it was felt that friends and family would not have the right level of knowledge.

Consumer rights information: In terms of consumer rights, everybody interviewed thought that guarantees or warranties were important. Good customer service was also important, as people wanted to know that they could get in contact with someone easily if something went wrong. Data protection was not something people tended to consider when making a purchase.

Online experiment: Introducing Predictiv and the trial design

Experimental design

We conducted this online experiment using **Predictiv**, **BIT's in-house online platform for running behavioural experiments**. Predictiv allows us and our partners to run randomised controlled trials (RCTs) with an online population of participants. For this research, we conducted an comprehension experiment, focused on comprehension, i.e. the impact of different types of product information (the prototypes) on the extent to which participants' understood the information presented to them. In addition, we also measured self-reported trust in manufacturers to provide 'good' information and the level of engagement or interest in the product, measured by whether or not participants in the experiment sought additional information. The following paragraphs summarise the key features of this online experiment.

The experimental design in Fig. 1 outlines the main phases in the participant journey. Upon entering the experiment, **participants are randomly divided into eight groups**, where each group is shown either the control condition or one of the prototypes (the prototypes are referred to here as 'treatments' 1-3) in either of its two variants (i.e. with or without the Trustmark). Each of those groups was then randomly split in half and with one group seeing the information with the government trustmark. The bottom section of the graph refers to the order of the types of questions we asked participants.

Once participants review the information they are taken through the same set of survey questions in the order as shown in Fig. 1., namely:

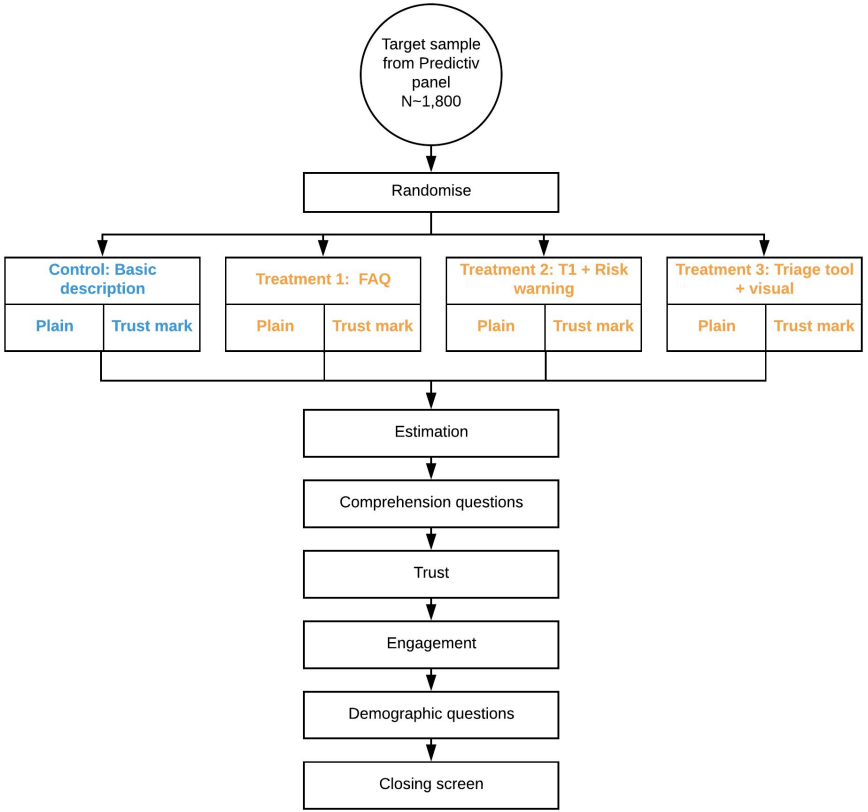


Fig. 1 Experimental design

Experimental Design - Survey Questions and participant incentivisation

Estimation: We asked participants whether they expected Battery X to save them money and if so, by how much.

Comprehension: A set of 11 comprehension questions made up the core of the experiment. We asked questions about individual benefits and requirements, the financial trade-off between benefits, the cost-benefit analysis when considering to buy Battery X and the environmental benefit. The order in which the questions appeared was randomised.

Trust: We asked how much people trusted manufacturers to provide information truthfully and comprehensively.

Engagement: To measure participants' engagement with the information, we offered to seek out more information by clicking on a relevant report and looked at click-through rates.

Demographics: We collected information on other characteristics relevant to this topic such as where the participant would look for information when shopping around for a Battery. Age, gender, income and location are automatically captured on the Predictiv platform.

The closing screen summarises the research scope and thanks participants for their contribution. The full survey is attached in Annex C.

Participant panel: The total participant pool in the UK covers more than 200,000 people who are roughly representative of the general UK population based on gender, age, location, and income.

Financial compensation: Participants are paid a fixed amount for their participation. In the context of this comprehension experiment, additional reward was given for each of the comprehension question (none of the other questions had a reward attached) that is answered correctly. For questions with multiple response options, we gave partial points if only some of the relevant response options were ticked, and we deducted partial points if wrong response options were ticked to prevent participants from just selecting everything.

Variable rewards are a cornerstone of experimental economics because they ensure that choices in the experiment have consequences. They can reduce the likelihood of participants giving socially desirable answers, focus attention, and can increase effort, particularly compared to no-stake environments.

Make-up of the recruited sample

THE
BEHAVIOURAL
INSIGHTS
TEAM

Demographic characteristics

We recruited a total of **1,816 participants.** Of these slightly more than half were female. Most were between the ages of 25 and 54, from across the UK (as shown in Fig. 4). We had slightly more people with household incomes above the UK median of £27,500 than below.

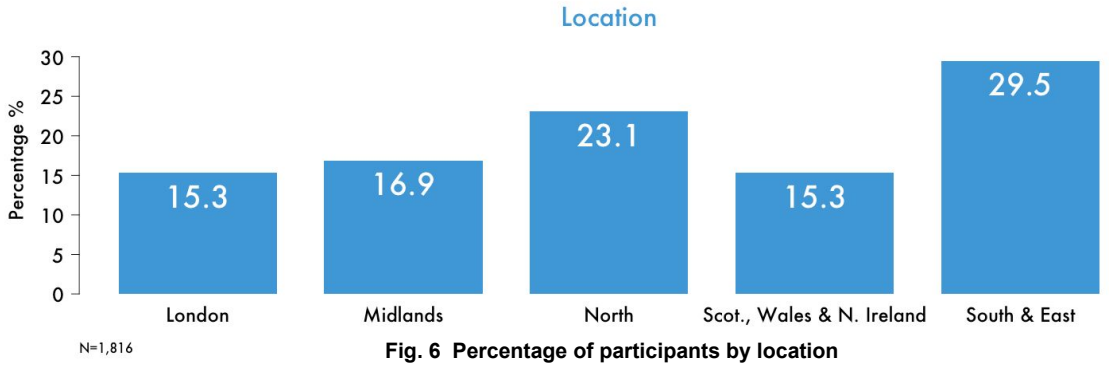


Fig. 6 Percentage of participants by location

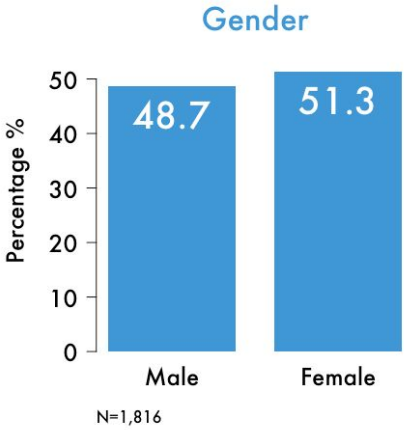


Fig. 2 Percentage of participants by gender

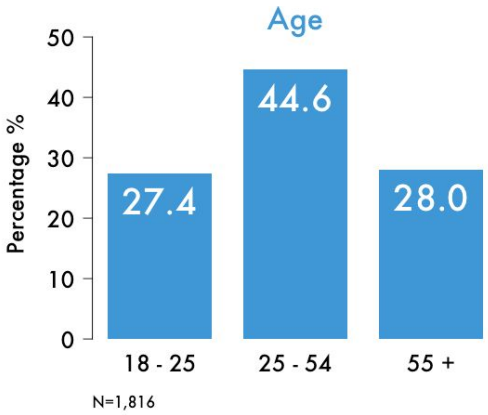


Fig. 3 Percentage of participants by age groups

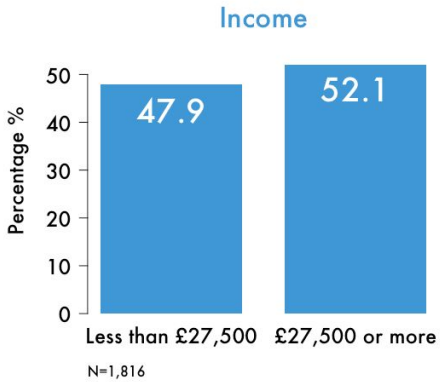


Fig. 5 Percentage of participants by household income

Topic specific characteristics

In addition to standard demographic variables, we also looked at participant's self-reported level of digital confidence and their housing status because both of these variables can be influential in their exposure and understanding of technologies like smart battery storage. We found that more than half of our participants reported to be 'very digitally confident', and only 8% reported to not feel digitally confident. (Fig. 7) This may be a slight over-representation of digitally confident people possibly explained by the fact that our sample are people who opted into an online experimentation panel and are therefore likely to be quite digitally savvy.

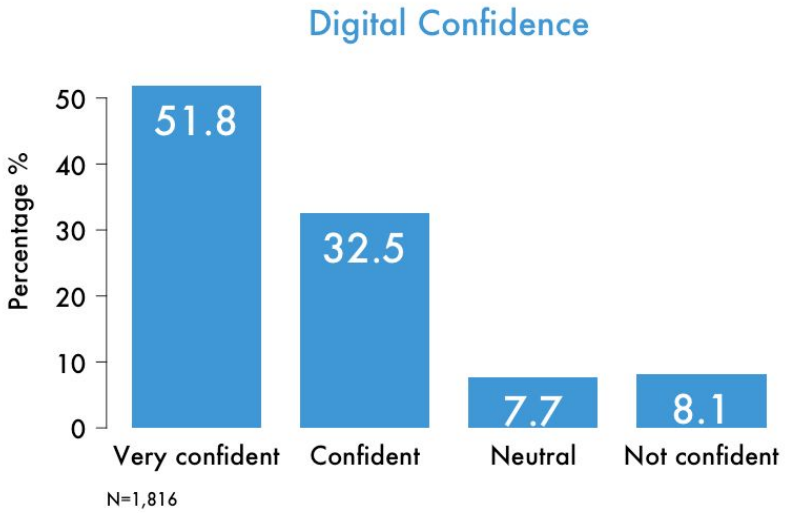


Fig. 7 Percentage of participants by self-reported level of digital confidence

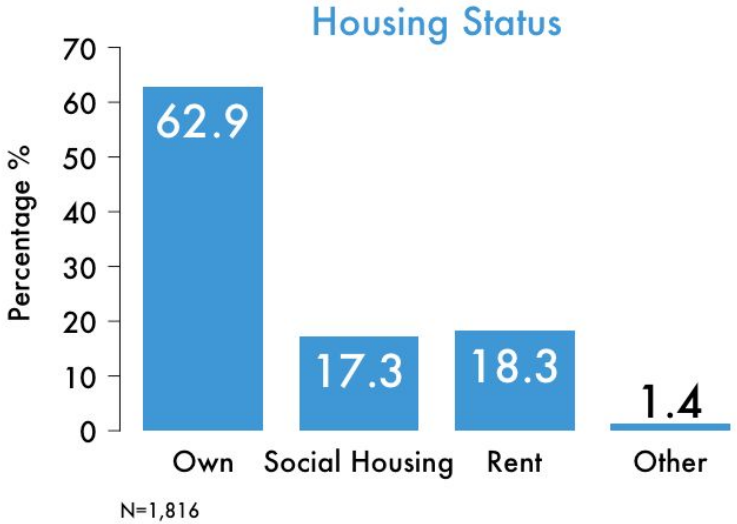


Fig. 8 Percentage of participants by housing tatus

Technology covariates

Finally, we also asked participants about whether they had a smart meter, a time of use tariff and solar panels. About half said they didn't have a smart meter, while 46% said they did. 58% of participants said they didn't have a time of use tariff, while 25% believed they did. Only about 12% of participants said they had solar panels, while the overwhelming majority (87%) said they didn't.

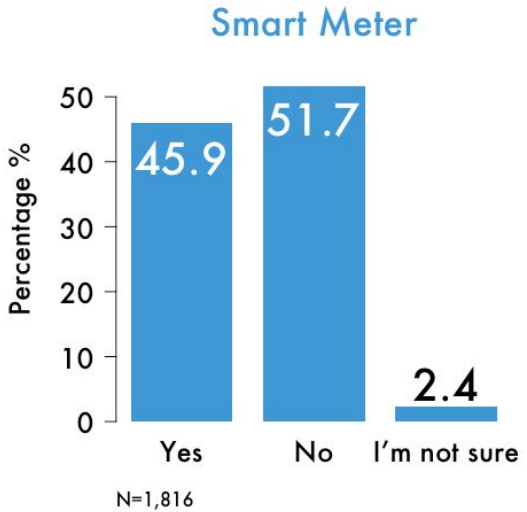


Fig. 9 Percentage of participants by self-reported smart meter ownership

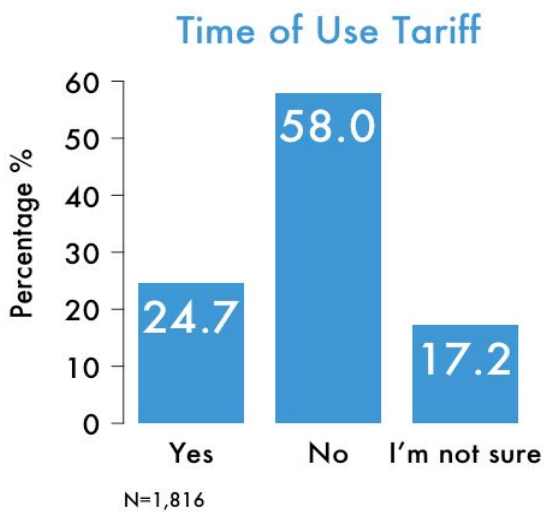


Fig. 10 Percentage of participants by whether or not they believed to have a time of use tariff

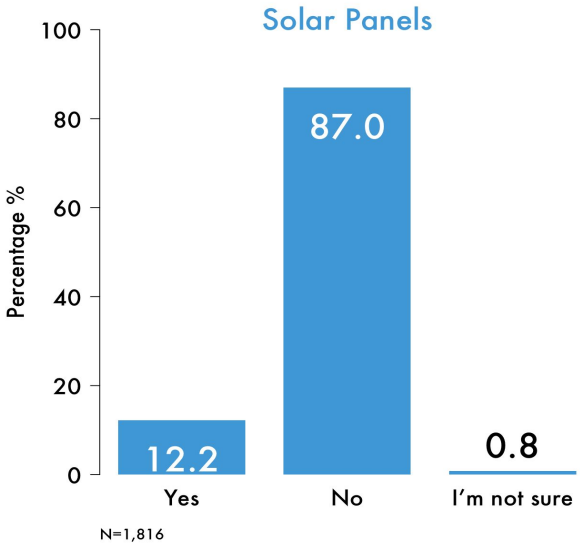


Fig. 11 Percentage of participants by self-reported solar panel ownership

Primary analysis

THE
BEHAVIOURAL
INSIGHTS
TEAM

Primary analysis: Comprehension (1/2)

This section of the report looks at the primary focus of the online experiment: the impact of the prototypes on overall comprehension (i.e. the average across all 11 comprehension questions). Overall we find that more than half of participants across all groups answered all of the questions correctly. Only prototype 3 (P3: triage tool + trade-off visual) significantly increased overall comprehension in comparison to the control by 4.3% (or 2.5 percentage points (pp)).

Communication principle #1: Illustrating complex information with visual cues increases comprehension.

Overall, participants demonstrate a decent understanding of smart battery storage but perhaps less than expected given that the experiment focused on the most basic definitions of benefits and requirements. This might suggest that static and generic information provision in this form is insufficient to substantially improve consumer comprehension.

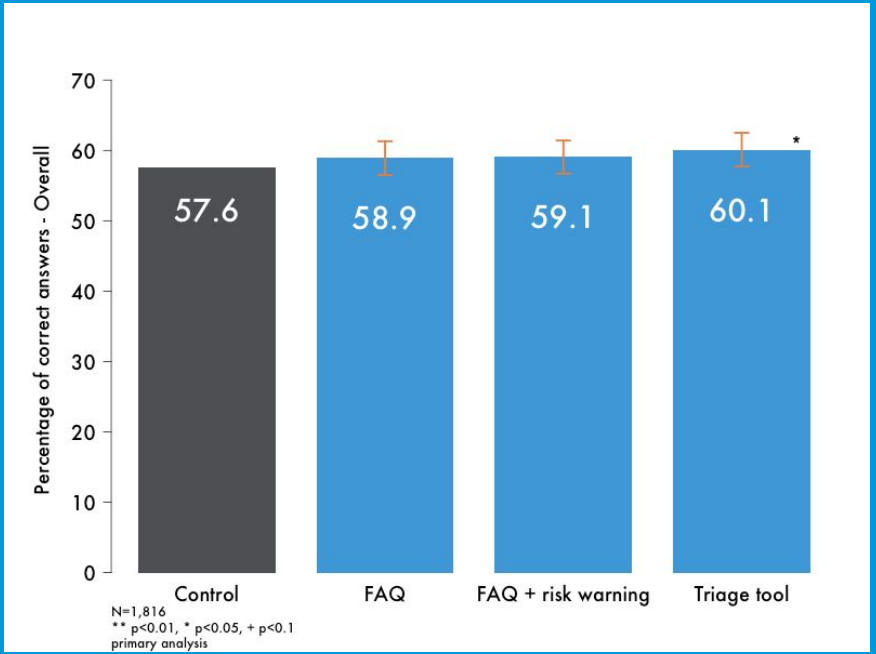


Fig. 12 The impact of the treatments on overall comprehension (average across all 11 questions)

Primary analysis: Comprehension (2/2)

Another consideration is that over time as the market matures, consumers will benefit from higher awareness of these products and their features, and if they consider buying one, they will likely spend a significant amount of time researching, whereas in our experiment, participants spend less than 12 minutes thinking about these devices. To understand the impact of effective information provision in a 'real-world' setting needs to be tested through rigorous research in the field to also understand the impact of effective information provision on the quality of purchasing decision. In turn this would give insight into the type of regulatory policy required to prevent consumer detriment in the smart battery storage market.

Communication principle #2: Robust field trials are necessary to understand the impact of product disclosures on actual purchasing decisions, consumer detriment and thus what it means for regulatory policy.

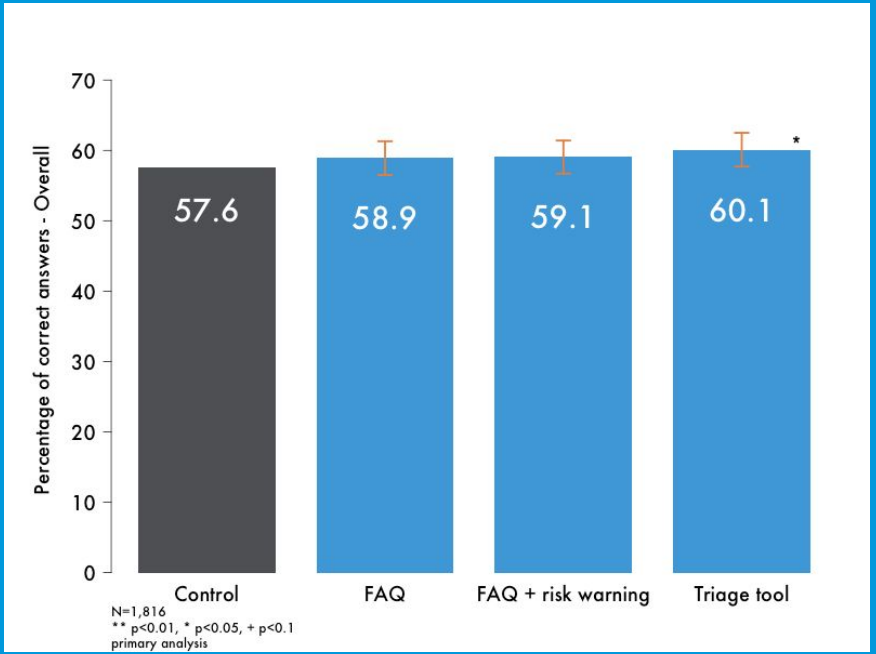


Fig. 12 The impact of the treatments on overall comprehension (average across all 11 questions)

Impact on the distribution of comprehension

The table to the right looks at comprehension at the top and the bottom of the distribution. None of the interventions appear to have an impact on those participants scoring low on the comprehension questions. They do however increase the share of those scoring in the top quartile from 19% in the control to 25% in P3.

These findings suggest that the change in how the information is presented might be useful for those with substantial existing knowledge but doesn't change much for those with a poor understanding of smart battery storage.

In ways this might exacerbate inequality between those more or less literate in the energy market. Similar trends are often found with health labels. They tend to lead to better outcomes among the more healthy (who are often more health-literate) but fall short of helping those that need the help more.

	Control	Prototype 1: FAQ	Prototype 2: FAQ + risk warning	Prototype 3: Triage tool + visual summary
Overall average (range) comprehension (%)	57.6 (0 - 98)	57.8 (0 - 100)	59.6 (9 - 100)	59.1 (11 - 100)
% of participants scored below 25%	5%	5%	6%	6%
% of participants scored above 75%	19%	24%	24%	25%

Table 1 Percentage of participants across control and treatments at extreme ends of the distribution

Overall comprehension across demographics

Age: Older individuals aged 25-54 and 55+ answer a higher proportion of questions correctly than those aged 18-24. (+3.0pp for 25-54 group; +9.1pp for 55+ group; significant at the 1% level). This might suggest that younger consumers, to the extent that they can afford it, might be at higher risk of consumer detriment in this market.

Income: Individuals with above-median income answer a higher proportion of questions correctly than those with below-median income (+2.2pp; significant at the 5% level).

Location: In general, the proportion of questions answered correctly is higher in areas outside of London (between 5.3 pp and 7.1 pp; all except 'North' are significant at the 1% level)

Gender and ethnicity: We do not find significant correlation on the characteristics of gender or ethnicity.

Housing: Individuals in social housing answer a lower proportion of questions correctly compared to those who report to own their own (-2.8 pp; significant at the 5% level). No other significant correlations were found for other housing status categories (renting, other).

Digital confidence: Individuals who report lower digital confidence than those saying they are 'very confident' answer a lower proportion of questions correctly (between 4.6 to 14.6 pp; significant at the 1% level).

Time of use tariff: Compared to individuals on a time-use tariff, those who are not or are not sure, answer a higher proportion of questions correctly (3.8-6.2 pp; significant at the 1% level).

Solar panels: Individuals who do not have solar panels, answer a higher proportion of questions correctly (+6.7pp; significant at the 1% level) compared to those that do have solar panels.

Smart meter: Individuals that do not have a smart meter answer a higher proportion of questions correctly compared to those that do have a smart meter (+3.3pp; significant at the 1% level).

Primary analysis

THE
BEHAVIOURAL
INSIGHTS
TEAM

What we looked at beyond overall comprehension

Breaking down overall comprehension into…

- **Benefits:** How well do participants understand the three main benefits of smart battery storage? These include the benefit of harnessing a time of use tariff, increasing the use of solar energy, and earning an income from flexibility services.
- **Requirements:** How well do participants understand the three key requirements to be able to harness all of the three benefits? These are a smart meter, a time of use tariff, solar panels and a dry and cool storage space.
- **Financial trade-off of benefits:** Do participants know that there is a direct trade-off between the benefits that can lower your energy bill and the one that earns you an income?
- **Cost benefit analysis:** Are participants aware of the key information required to decide whether investing in smart battery storage?
- **Environmental benefit:** Are participants aware of the potential environmental benefit to smart battery storage?

As well as:

Engagement: Do the treatments impact the extent to which participants express interest by engaging with further reading?

Trust: Does a trustmark improve trust in manufacturer's product descriptions?

Estimated level of savings: Do the treatments impact participants' estimate of whether, and how much Battery X can save them on their energy bill?

Comprehension of the benefits

All prototypes significantly improved comprehension of the benefits associated with smart battery storage. This shows there is scope to provide more and better information on the basic benefits of smart battery storage. The triage tool + visual trade-off prototypes improved comprehension the most, from a baseline level of 49.5% to 56.1%, which suggests that illustrations aid comprehension by making the content more salient and memorable.

With a baseline of 49.5%, in comparison to other elements of the information - for instance, the requirements - participants struggled more to understand the Battery X's benefits. In particular, the flexibility service wasn't well understood with scores ranging from 20% in the control to 38.6% in P2 (FAQ + risk warning).

This comprehension measure is an aggregate of comprehension of 4 individual questions:

- A multiple choice question asking participants to select the benefits from a longer list of items
- The benefits from harnessing a time of use tariff
- The benefits from using the battery with solar panels
- The benefit from signing up for a flexibility service

Communication principle #3: There is a clear need for more and better information provision on the basic benefits of smart battery storage than is currently found on manufacturer websites.

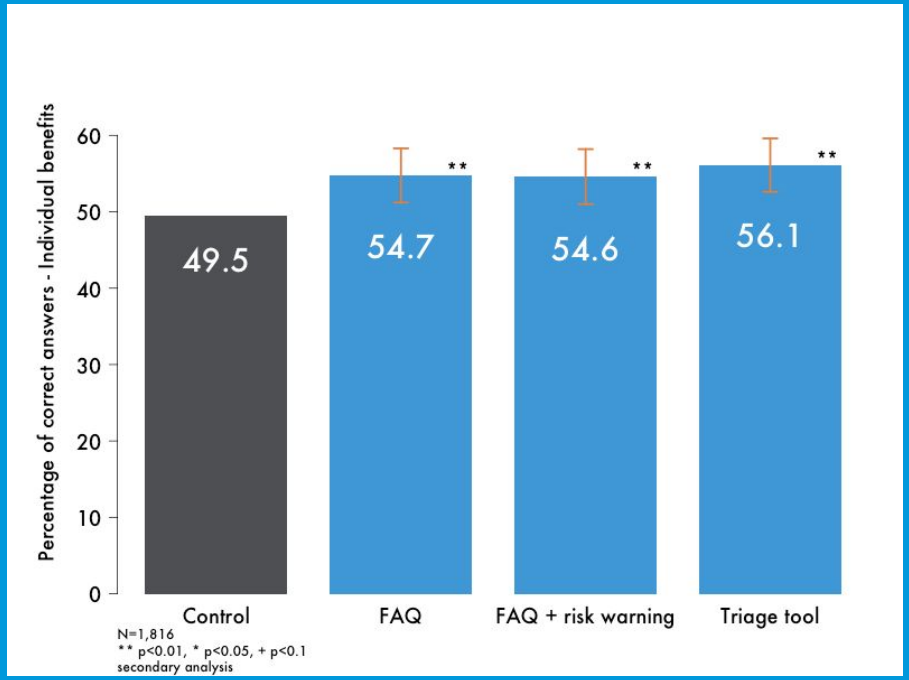


Fig. 13 The impact of the treatments on comprehension of the benefits

Comprehension of the requirements

None of the prototypes improved comprehension of the requirements. While only weakly significant, P2 (FAQ + risk warning) decreased comprehension by 3 percentage points (pp) in comparison to the control. There is no significant difference between the other prototypes and the control.

These results reflect that the prototypes didn't put as much emphasis on highlighting the requirements as they did on the benefits of smart battery storage. There requirements were listed and emphasised in association with the respective benefit they serve but the narrative was built around the benefits. To improve comprehension of the requirements beyond the already high baseline level (across the control and all prototypes, participants understood these better than the benefits), they might need to be made more salient through visual cues like a 'requirement call-out box', for example.

This comprehension measure is an aggregate of comprehension of 3 questions asking

- If one needs solar panels to harness all of Battery X's benefits
- If one needs a time of use tariff to harness all of Battery X's benefits
- To select all requirements necessary to access all of BatteryX's benefits from a longer list of items

Communication principle #4: The requirements are better understood than the benefits but should still be communicated saliently, not just in association with the respective benefits they serve.

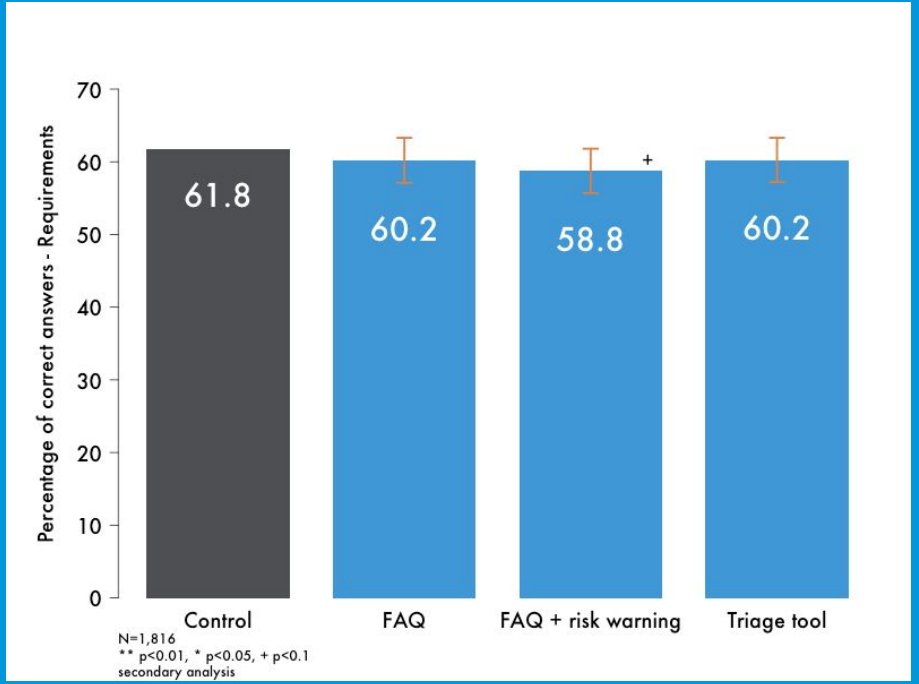


Fig. 14 The impact of the treatments on comprehension of the requirements

Comprehension of the financial trade-off

None of the prototypes significantly improve comprehension of the financial trade-off between benefits in comparison to the control. In fact, **c**omprehension seems to decrease in P2 (FAQ + risk warning) (-5.1pp) although this is weakly significant only. Interestingly, when comparing P1 (FAQ) to P2 (FAQ + risk warning), we do find a significant difference, whereby P2 decreased comprehension of the financial trade-off between benefits by 6.4 pp. This difference can be directly related to the risk warning in P2 as it was the only difference between these two prototypes.
It seems that a risk warning about a cost-benefit analysis related to the purchase of smart battery storage diverts attention away from the more subtle cost-benefit analysis,which is that between difference benefits.

This shouldn't distract from the fact that, overall, participants showed a good grasp of this trade-off, with baseline comprehension at (70.9%).

Communication principle #5: Stating that there is a financial-trade-off between benefits is sufficient to achieve decent levels of comprehension. Salient risk warnings on other trade-offs can divert attention away.

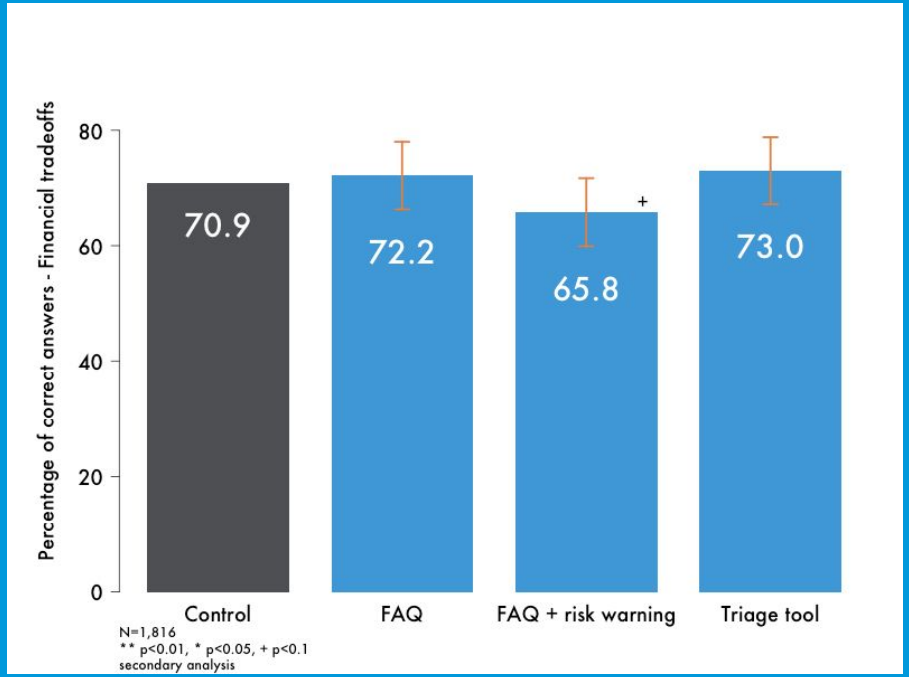


Fig. 15 The impact of the treatments on comprehension of the financial trade-off between benefits

Comprehension of the cost-benefit analysis

We find that P2 (FAQ + risk warning) significantly improved comprehension of the cost-benefit analysis associated with the investment in smart battery storage (+7pp) in comparison to the control. This suggests that the risk warning was effective in what it was intended for: raising awareness that smart battery storage isn't for everyone and that investment should be based on a complex cost-benefit calculation.

Communication principle #6: 'Longer' risk warnings are effective in the context of smart battery storage at drawing attention to the cost benefit calculation necessary to decide if it's a worthwhile investment.

Interestingly, we also find that P1 (FAQ) on the other hand, significantly decreased comprehension (-8.2pp) in comparison to the control as well as in comparison to P2 (FAQ + risk warning), which was associated with a 15.2pp difference at ($p < 0.01$) in comparison to P1. This result suggests sometimes 'less is more' in the sense that the more lengthy explanation of the benefits in P1 (FAQ) in comparison to the control might have crowded out participant attention and reflection on information that is implicit (i.e. the cost-benefit analysis). There is no statistically significant change in P3 (triage tool + trade-off visual).

Communication principle #7: Consumer attention is limited to the extent that lengthy information on the benefits of smart battery storage draws away attention and reflection from implicit consequences, such as the cost-benefit analysis.

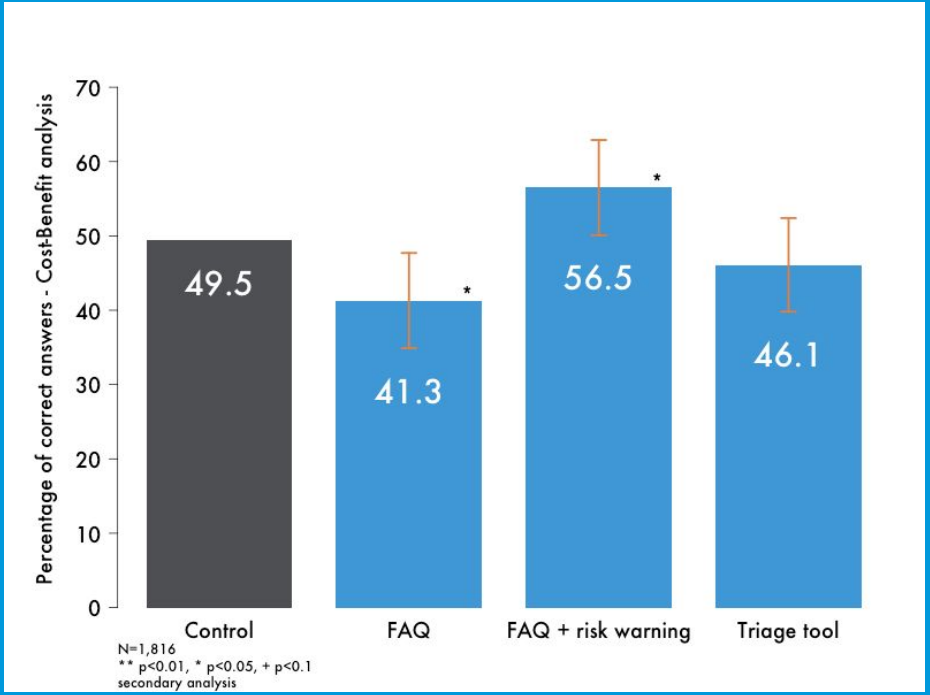


Fig. 16 The impact of the treatments on comprehension of the cost-benefit analysis related to the investment in smart battery storage

Environmental benefit

We find a significant increase in comprehension of the environmental benefit of smart battery storage in all prototypes, except P2 (FAQ+ trade-off visual). There is also no statistically significant difference in comprehension between the P1 (FAQ) and P2 (FAQ + risk warning).

We speculate that the risk warning in a call-out box has a very strong effect on consumer attention to the extent that it diverts attention away many other pieces of the information.

Communication principle #8: Manufacturers can increase comprehension of the environmental benefit by explicitly stating it. But if other elements are highlighted in a very salient way (e.g. call out box) it can divert the attention away from the environmental benefit.

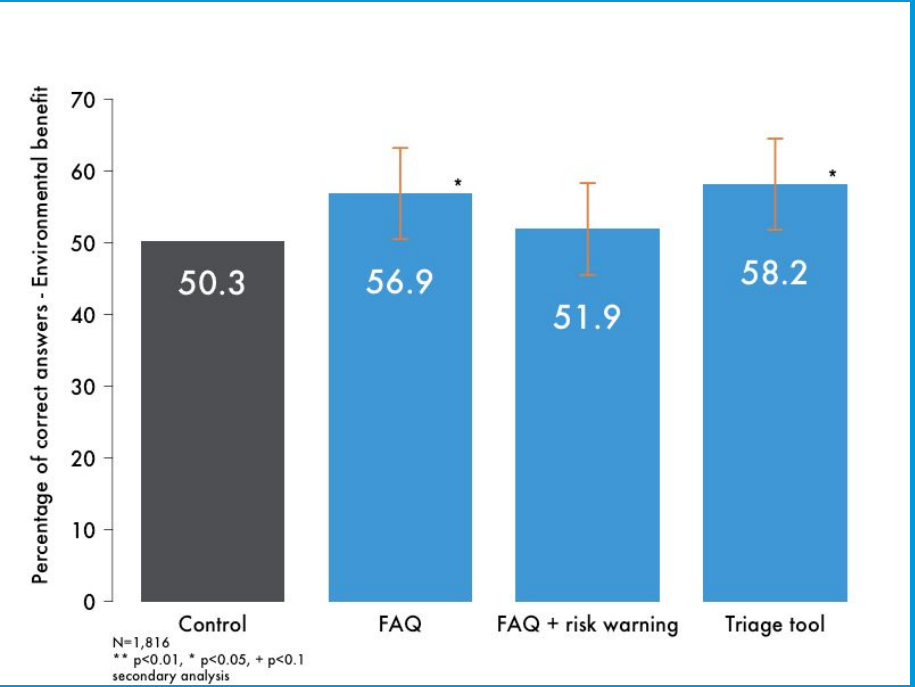


Fig. 17 The impact of the treatments on comprehension of the environmental benefit

Engagement

Finally, we found that the prototypes did not increase the level of interest in seeking out more information on smart battery storage, measured by click-through rates to a consumer guidance report on smart batteries and solar (herein referred to as 'engagement'). Participants were prompted to seek out more information after the comprehension questions. The proportion of individuals clicking the link in the control was 17%, which is similar to the level of 'engagement' found in other online experiments. There was no significant difference in engagement between the prototypes and the control.

Given that the prototypes were primarily designed to increase comprehension, this result is largely unsurprising. We might have expected P3 (triage tool + trade-off visual) or the risk warning in P2 to drive engagement with its visuals a bit more. As this engagement measure looks at 'interest in seeking out more information', we might also hypothesise that better information provision might actually have reduced the consumers' need to seek out more information, and therefore drive the engagement measure down. While more research is needed to understand what drives 'engagement', none of the prototypes here had a significant impact on the proportion of participants seeking out more information.

Communication principle #9: More research is needed on the type of information provision that gets consumers interested in seeking out more information. While visuals and risk warnings might be more engaging, better information on manufacturer's websites might reduce the need to search for other information.

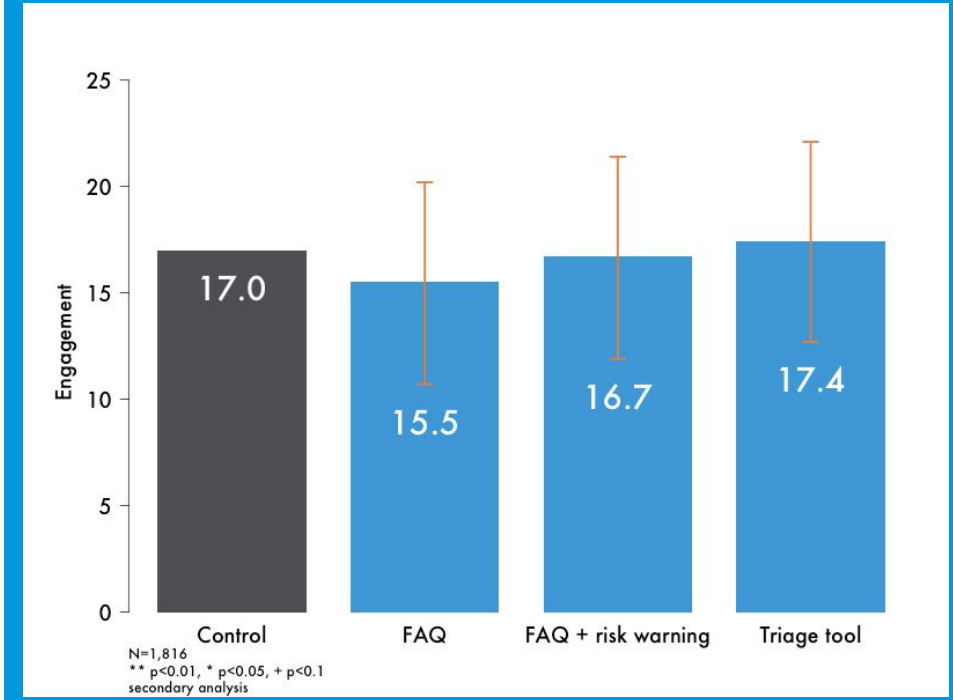


Fig. 18 The impact of the treatments on participants' level of engagement

Estimated saving

We asked participants' to estimate how much they thought smart battery storage could save them on their energy bills. In the control, participants' estimates averaged around 19.2% of savings. In this question we were interested in looking at the relative differences in estimated savings between the control and the prototypes rather than the absolute estimated savings level. We found that only P2 (FAQ + risk warning) yielded a significantly different estimate (a 2.7pp reduction) to that in the control. There was also a significant reduction in estimated savings by pp 3.65 between P1 (FAQ) and P2 (FAQ + risk warning). This effect can be directly traced back to the risk warning, which drew participants' attention to the risks of investing in smart battery storage and induced more conservative perceptions about its potential benefits.

Communication principle #10: An explicit risk warning makes people more risk averse by inducing more conservative perceptions about the potential benefits of smart battery storage.

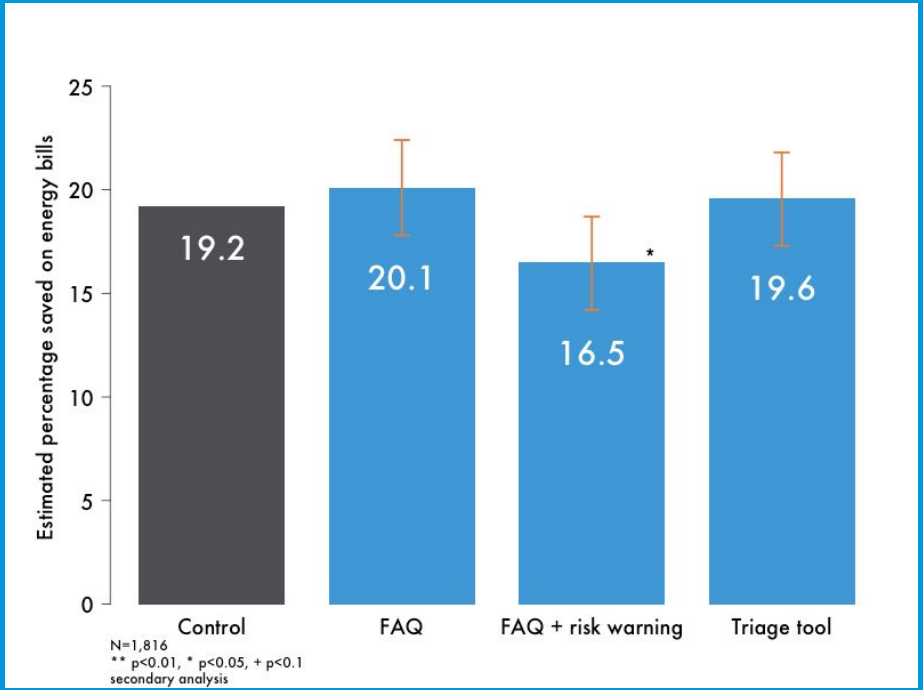


Fig. 19 The impact of the treatments on the estimated energy cost saving from smart battery storage

Trust in the manufacturer

Here, we were specifically interested in whether the inclusion of the trust mark was associated with increased trust in the manufacturer of Battery X. We did not expect that the treatments will have any effect on trust, and therefore only looked at the aggregated effect of the trustmark across the control and all prototypes.

We did not find that the trustmark increased self-reported trust in the manufacturer to provide truthful and comprehensive information. The effect is actually directionally negative (-0.1 pp change) but this effect is only weakly significant ($p < 0.10$). It should be noted however that in both cases, reported trust was fairly high to start with, with averages of 4.9 and 4.8 from a scale of 1 ‘not at all’ to 7 ‘completely’.

Communication principle #11: A government trustmark does not increase self-reported trust in manufacturer’s to provide truthful and comprehensive information.

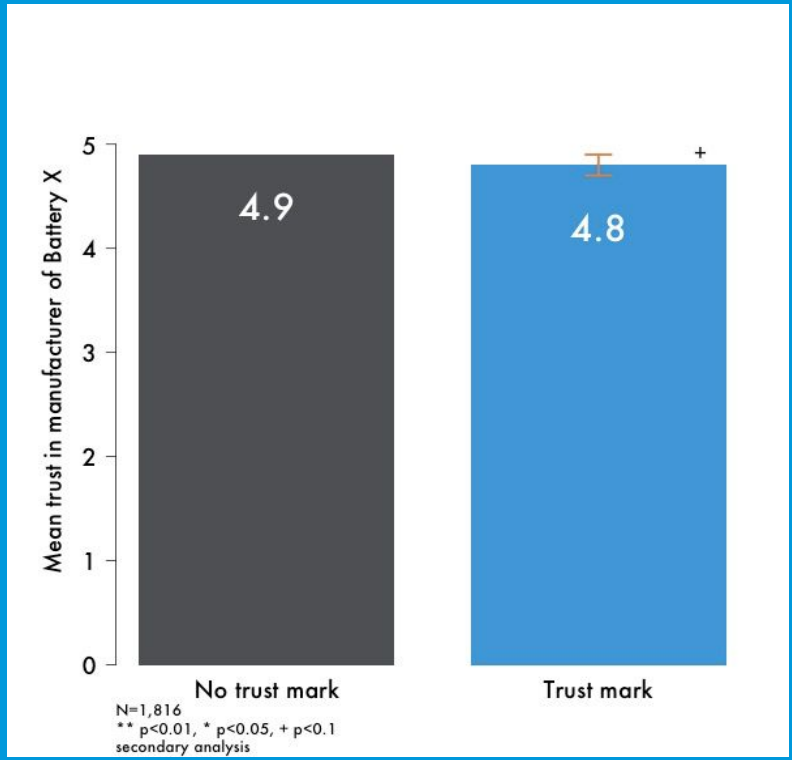


Fig. 20 The impact of the trustmark across control and the prototypes on trust in the manufacturer to provide truthful and comprehensive information

Descriptive & exploratory analysis

THE
BEHAVIOURAL
INSIGHTS
TEAM

Additional descriptive statistics to report

After participants had gone through the experiment questions, we asked a few additional questions to collect data on our sample.

First, participants were asked "*Having read about Battery X would you consider buying a smart battery for your home? Please explain your answer.*" We found that 15% of participants answered *'no'*, 37% answered *'unsure'* and 48% answered *'yes'*, which is much higher than data of actual purchases would suggest. (Fig. 22) These results should be interpreted with caution. Self-reported measures such as this tend to overlap poorly with people's actual behaviour.

Second, participants were asked to indicate whom they would want to get information from about Battery X before purchase. The percentage distribution across different 'trusted advisors' is outlined in Fig. 21. In addition to what's shown in Fig. 21, 58 participants (3%) also responded 'other', including local council, on one, friends who have used Battery X or existing customers, internet searches, housing association, publications, my solar panel installer, forums or review sites, and letting agent.

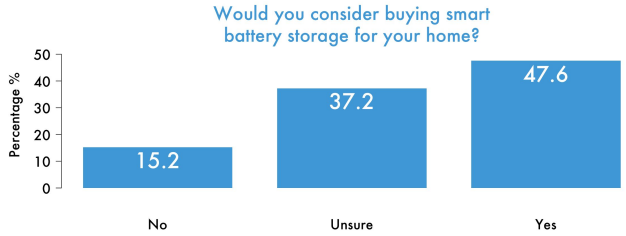
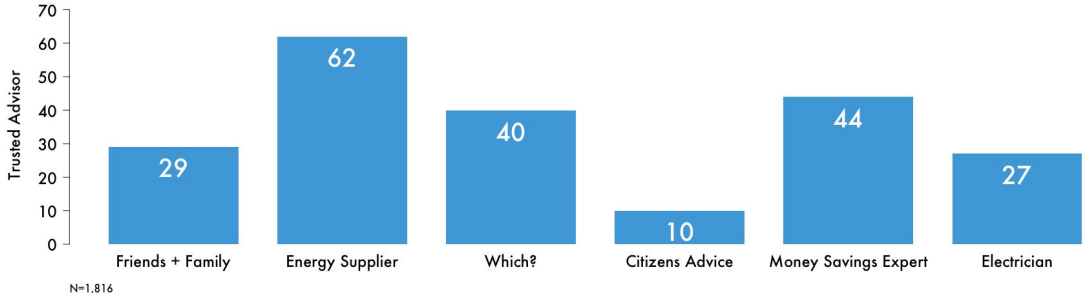


Fig. 22 Distribution of whether or not participants would consider buying smart battery storage

Fig. 23 Distribution of 'trusted advisors' as a share of all responses



Additional descriptive statistics to report

Finally, we asked participants to report what piece of information they would be looking for before buying smart battery storage. The distribution of responses is shown in Fig. 22, with contact for issues, detail on functionality and information on warranty or a guarantee being the 3 most popular types of additional information sought out by consumers before deciding to purchase devices such as smart battery storage.

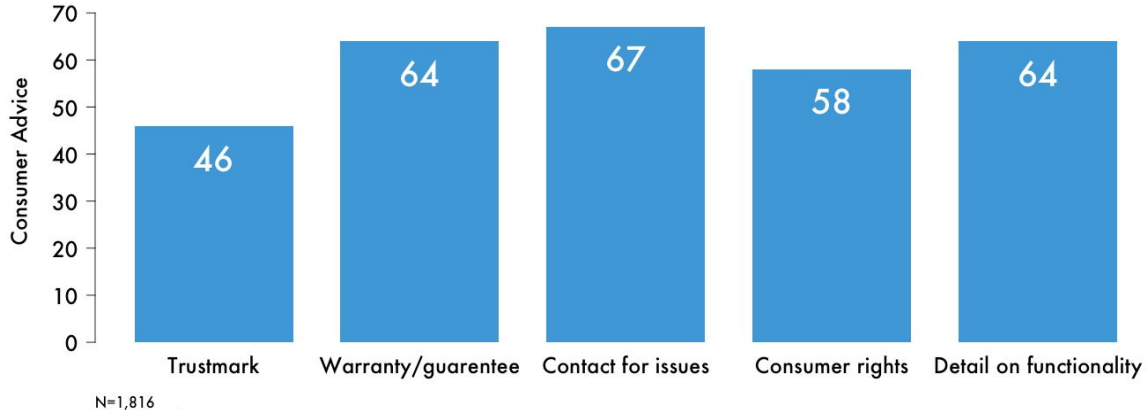


Fig. 22 Distribution of types of information sought out by consumers

Conclusions and ‘scale’

THE
BEHAVIOURAL
INSIGHTS
TEAM

Discussion of findings

Our results clearly demonstrate how information on complex products such as smart batteries can be communicated effectively to improve consumer comprehension. Our prototypes primarily focused on explaining the financial benefits of smart battery storage, and we saw a significant increase in comprehension of these across all prototypes. Compared to the control, we also saw a significant increase in understanding of the environmental benefit apart from in P2 (FAQ + risk warning). However, the prototypes were not successful at drawing attention to the requirements for the product, although baseline comprehension of the product requirements was already very high. This suggests that focusing on the illustration of the benefits rather than the requirements is the right strategy if space is limited.

The third intervention, P3 (triage tool + trade-off visual) was an attempt to illustrate the trade-off between the various benefits, which is particularly relevant for those who sign up for a flexibility service. While comprehension of the financial trade-off was highest in P3, it is surprising that it was not significantly better than the control. Perhaps the most striking and significant finding however, is the adverse effect of the risk warning call-out box on comprehension of the rest of the information. While P2 (FAQ + risk warning) did particularly well in communicating the cost-benefit calculation of purchasing smart battery storage, in doing that it diverted attention away from other aspects of the information such as the trade-off between benefits.

Participants seeing P2 also did also worse in recalling the requirements than those in the control - albeit not significantly - even though the requirements are implicit to the risk warning. This suggests that consumer attention when browsing product information online, is limited, and easily distracted by highly salient visuals (e.g. call-out box) and alerting messages (risk warning). Manufacturers and regulators therefore need to prioritise key pieces of information to be communicated at this early stage of the consumer journey, in particular when making use of salient visuals such as call-out boxes.

It should be highlighted that the level of information provided in the baseline went beyond what can be found on some manufacturer's websites to date. The baseline comprehension in our experiment is therefore likely to be higher than what would be expected in the real world. This suggests that some elements of our prototypes that didn't yield a significant improvement in comprehension relative to the control, should still be considered as possible communication principles, and undergo further testing.

The following slides present the key communication principles and the corresponding evidence. The first two slides refer to the principles that correspond directly to the findings from this trial, while the third slide includes those that support the broader research agenda to improve the information provision for smart battery storage. We follow this up with two communication principles based on the qualitative research.

Key lessons from the online experiments

Communication Principle	Trial Findings
Communication principle #1: Illustrating complex information with visual cues increases comprehension.	P3 (triage tool + trade-off visual) was the only intervention which significantly improved overall comprehension in comparison to the control.
Communication principle #8: Manufacturers can increase comprehension of the environmental benefit by explicitly stating it. But if other elements are highlighted in a very salient way (e.g. call out box) it can divert the attention away from the environmental benefit.	P1 (FAQ) and P3 (triage tool + trade-off visual) both significantly increased comprehension of the environmental benefit. However, P2 (FAQ + risk warning) didn't have an impact.
Communication principle #10: An explicit risk warning makes people more risk averse by inducing more conservative perceptions about the potential benefits of smart battery storage. At the same time it doesn't put consumers off from seeking out more information (see principle #9).	Only P2 (FAQ + risk warning) yielded a different estimate from the control, of how much participants thought smart battery storage could save them on their energy bill. Given there is no difference in outcomes between the control and P1, the risk warning might have made participants more sensitive to complexity involved in harnessing all benefits.
Communication principle #6: 'Longer' risk warnings are effective in the context of smart battery storage at drawing attention to the cost benefit calculation necessary to decide if it's a worthwhile investment.	P2 (FAQ + risk warning) substantively increased comprehension of the cost-benefit analysis involved in making the right choice about purchasing smart battery storage.

Key lessons from the online experiments

Communication Principle	Trial Findings
Communication principle #5: Stating that there is a financial-trade-off between benefits is sufficient to achieve decent levels of comprehension. Salient risk warnings on other trade-offs can divert attention away.	Although none of the prototypes increased comprehension of the financial trade-off between benefits, baseline comprehension was relatively high in comparison to other elements of the product information. We saw that participants in P2 (FAQ + risk warning) seemed to understand the trade-off the least. The risk warning might diverting their attention away from other elements in the prototypes.
Communication principle #7: Consumer attention is limited to the extent that lengthy information on the benefits of smart battery storage draws away attention and reflection from implicit consequences, such as the cost-benefit analysis.	P1 (FAQ) significantly decreased comprehension of the cost-benefit analysis. As P2 increased comprehension and the only difference between P1 and P2 was the risk warning, we think the risk warning makes up for the adverse impact P1 has on comprehension in comparison to the control.
Communication principle #4: The requirements are better understood than the benefits but should still be communicated saliently, not just in association with the respective benefits they serve.	None of the prototypes improved comprehension of the requirements. The narrative in all three prototypes was structured around the benefits rather than the requirements.
Communication principle #11: A government-endorsed trustmark does not increase self-reported trust in manufacturers to provide truthful and comprehensive information.	There was no significant difference in the level of self-reported trust in the manufacturer as a result of including the Trustmark.

Key lessons from the online experiments

Communication Principle	Trial Findings
Communication principle #3: There is a clear need for more and better information provision on the basic benefits of smart battery storage than is currently found on manufacturer websites.	All our prototypes directionally improved comprehension of the benefits of smart battery storage in comparison to the control condition. In comparison to actual product descriptions to date, the improvement of comprehension of benefits might be even stronger given that the quality of our control was better than the current business as usual.
Communication principle #9: Overall, none of the prototypes changed the likelihood of consumers seeking out more information. More research is needed to understand what drives engagement with more information as different elements of the prototypes may have worked in different directions. Visuals and risk warnings might be more engaging, better information on manufacturer's websites might reduce the need to search for other information.	None of the prototypes significantly increased the proportion of participants seeking out more information when they were prompted to click on a consumer guidance report on smart batteries and solar power after having been through the comprehension questions. This measure was not intended to measure engagement with the subject or the product itself but the extent to which participants are interested to read more.
Communication principle #2: Robust field trials are necessary to understand the impact of product disclosures on actual purchasing decisions, consumer detriment and thus what it means for regulatory policy.	Results from this laboratory online study don't allow us to make any conclusions about how product disclosures impact actual purchasing decisions about smart battery storage, and therefore our understanding of the effect of the prototypes (and improved comprehension) on the prevention of consumer detriment is limited.

Communication principles based on qualitative research

We synthesise the findings from the qualitative research into two communication principles that we think are valuable to consider, in particular with a view towards consumers in vulnerable circumstances.

Communication Principle based on consumers in vulnerable circumstances	Interview Findings
Communication principle #1: Product information on manufacturer websites is likely insufficient to enable consumers to adequately interact with and benefit from energy suppliers as decentralisation progresses.	Earning an income from signing up to a flexibility service was the benefit participants struggled to understand the most. It seemed they were generally confused about why and how an energy supplier would pay them and what they are offering the supplier in exchange.
Communication principle #2: The increasing complexity of the energy market will require much simpler and better communication of key concepts like ‘kilowatt hours’ or ‘time of use tariffs’.	Complex but commonly used terms such as ‘kilowatt hours’ and especially ‘time of use tariff’ was not well understood and therefore limited consumers comprehension of the features of smart battery storage.

Scaling and next steps

Spreading best-practice

With many different types of smart home technologies entering the market and people's homes, it is important that consumers understand what these devices can do for them and also what risks they bear. Manufacturers need to provide product information that allows consumers to do exactly that, and ultimately enable them to buy the products that are right for them.

With this in mind, Citizens Advice set out to generate evidence that will form the basis of a 'best practice guide' for industry on principles of effective information provision. This project is a first step on that research trajectory. We have now gained substantial insight into consumer comprehension of the basic benefits and requirements of smart battery storage. But there are a few more steps to take until we can scale these results and build a robust best-practice guide to prevent consumer detriment.

Replicating and validating the findings

Scaling these findings would, in the first instance, be about replicating and validating our results. We would start by trying to replicate the findings of the online comprehension experiment by developing one 'best of' prototype that contains all elements that worked and has been stripped of those that didn't. One would expect that combining these effective elements would lead to improved comprehension, however there is a risk that these results do not replicate when combined into a single prototype, and so we would want to compare this combined treatment to the current control condition to see how the features interact and affect overall comprehension'

We then propose testing these interventions under real-world conditions once the market has matured. In a field experiment we would observe and measure the impact of the proposed 'best practice guidance' on actual purchasing decisions, and the extent to which these were the right purchasing decisions.

This stage of the research could also go beyond information provision on generic and static pieces of information and include more interactive tools where users can tailor the information and recommendations to their individual circumstances as energy consumers. This is particularly important as the findings from the experiment show that, while the treatments were successful in improving comprehension of the benefits of the product, they did not improve comprehension of the requirements. This might partly be explained by the fact that the narrative of the prototypes focused on the benefits, and the requirements listed briefly and then only explained as a function of the respective benefits. However, this does not suggest that spelling out both benefits and requirements equally might lead to better comprehension. We've seen throughout the experiment that consumer attention is limited, which means there is a risk of information overload. An interactive tool might be able to address this challenge more effectively because people would be exposed to the information sequentially and therefore engage more with each product feature.

Appendices

THE
BEHAVIOURAL
INSIGHTS
TEAM

Overview of appendices

A: Comprehension levels across subgroups as defined by the Ofgem attitude-based segmentation of consumer engagement in the energy market

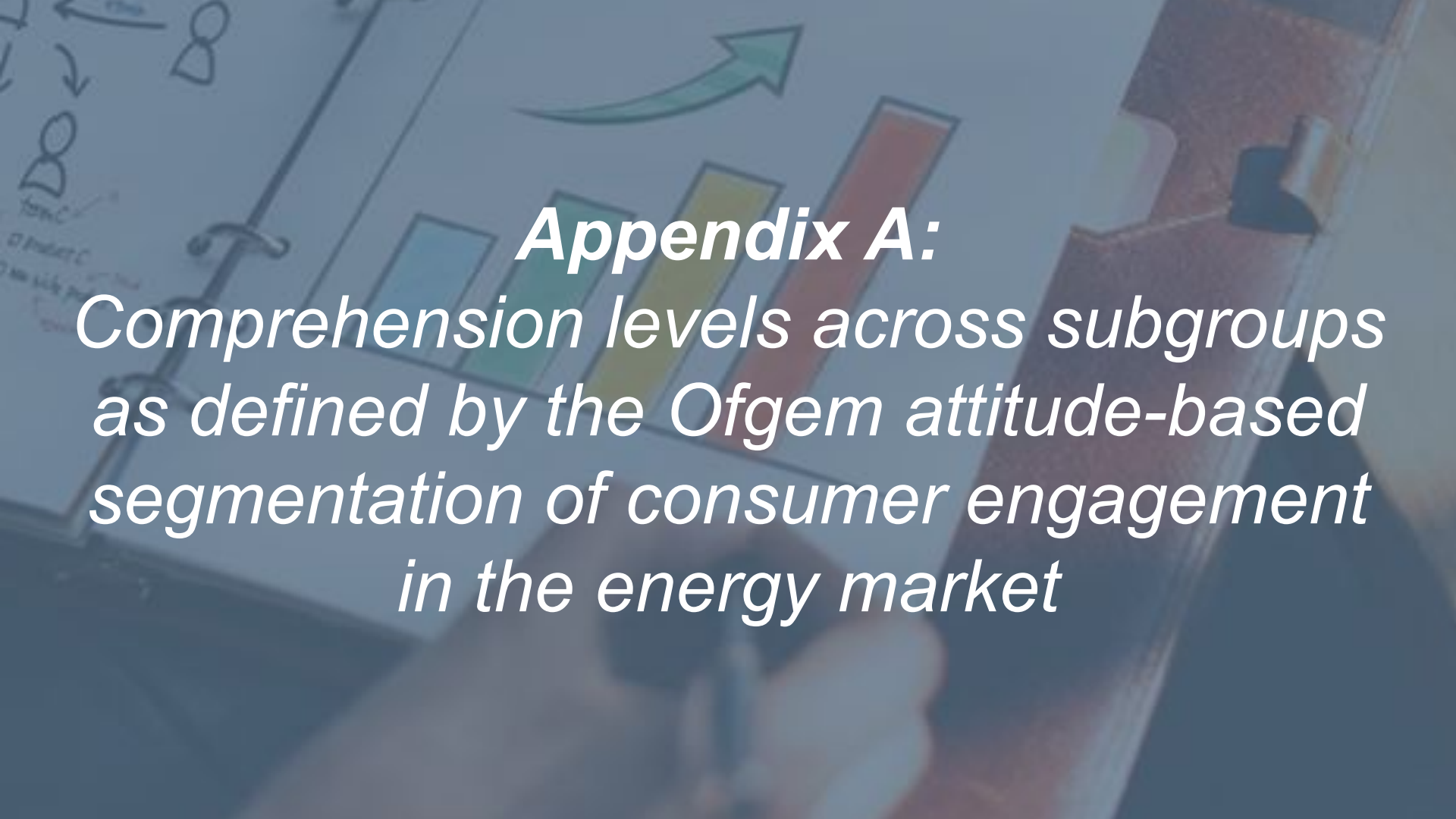
B: Tables with additional exploratory analysis and sub-group tables

C: Prototypes with trustmark

D: Predictiv survey

E: Interview discussion guide

F: Evidence review



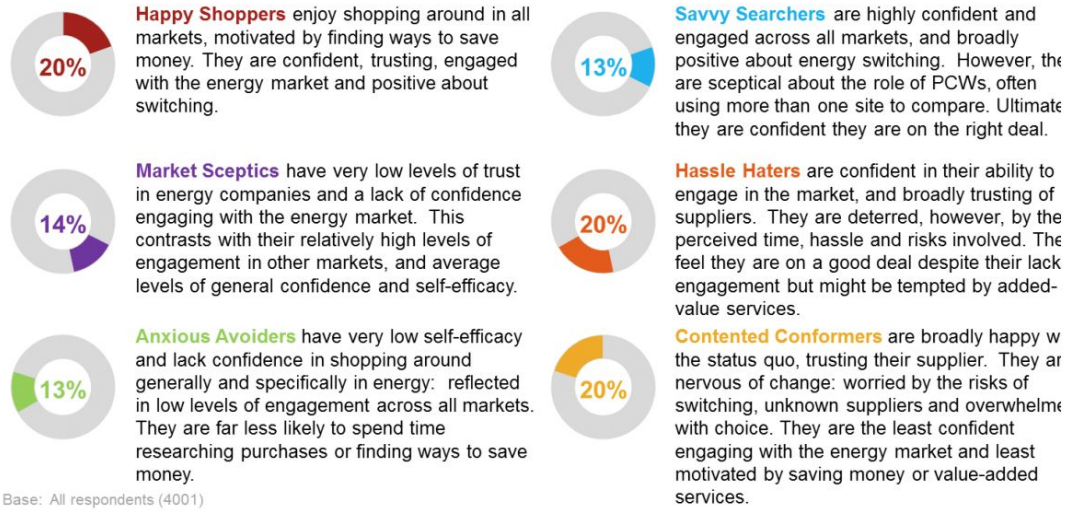
Appendix A:

Comprehension levels across subgroups as defined by the Ofgem attitude-based segmentation of consumer engagement in the energy market

Attitude-based segmentation of consumer engagement in the energy market

To better understand consumer engagement with the energy market, its motivators and barriers, in 2016, Ofgem commissioned GfK to develop an existing tracking survey, previously run from 2014-2016 by TNS BMRB. In 2017, GfK ran a new attitude-based segmentation survey which grouped energy consumers into distinct attitudinal subgroups. These attitudinal groups differentiate on key attributes such as consumer behaviours in the energy market (specifically, levels of engagement in the energy market), personal attributes (e.g. switching in other markets, internet use) and demographics.

The graph below describes each segment's size and characteristics in more detail.


20%
Happy Shoppers enjoy shopping around in all markets, motivated by finding ways to save money. They are confident, trusting, engaged with the energy market and positive about switching.
13%
Savvy Searchers are highly confident and engaged across all markets, and broadly positive about energy switching. However, the are sceptical about the role of PCWs, often using more than one site to compare. Ultimate they are confident they are on the right deal.
14%
Market Sceptics have very low levels of trust in energy companies and a lack of confidence engaging with the energy market. This contrasts with their relatively high levels of engagement in other markets, and average levels of general confidence and self-efficacy.
20%
Hassle Haters are confident in their ability to engage in the market, and broadly trusting of suppliers. They are deterred, however, by the perceived time, hassle and risks involved. The feel they are on a good deal despite their lack engagement but might be tempted by added-value services.
13%
Anxious Avoiders have very low self-efficacy and lack confidence in shopping around generally and specifically in energy: reflected in low levels of engagement across all markets. They are far less likely to spend time researching purchases or finding ways to save money.
20%
Contented Conformers are broadly happy w the status quo, trusting their supplier. They ar nervous of change: worried by the risks of switching, unknown suppliers and overwhelme with choice. They are the least confident engaging with the energy market and least motivated by saving money or value-added services.
Base: All respondents (4001)

We examined whether the impact of the treatments affect comprehension levels for each of these segments differentially. We aggregated across all treatments (P1, P2 or P3) and measured the difference in overall comprehension between the combined treatments and the control group. The next slide summarises the findings.

Source: Ofgem, Consumer engagement in the energy market 2017

Ofgem personas - descriptive findings

The findings are shown in Fig.23 below. We do not find sufficient evidence to suggest that there are differences in the impact of the treatments on comprehension across the various personas. The prototypes appear to have statistically improved comprehension in the ‘Market Skeptics’ category, however we must caution that we have performed several statistical comparisons, so that there is a higher than usual chance that this is a false discovery.

Please note that these findings are merely exploratory and should not be treated as causal. The interventions were not designed to target specific Ofgem personas and the study was not designed to identify the differential impact of the interventions across the various personas. Moreover, the trial does not have a sufficient sample size to draw causal inferences for each subgroup. The statistical tests are also merely indicative and should not be treated as conclusive and we have not corrected for multiple comparisons. In order to draw firm conclusions on the differential impact of the interventions for the various Ofgem personas, we propose that additional research be conducted.

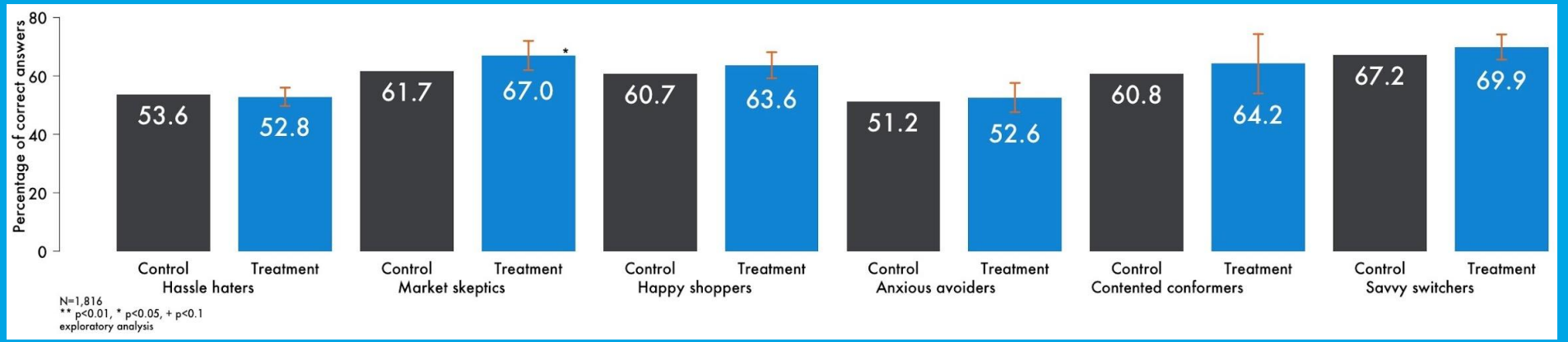


Fig. 23 Effect of the aggregated treatment across each persona

Additional statistics

Table 2 on the right summarises the average percentage of questions answered correctly across personas, and according to whether they saw the control or one of the prototypes. Please note that these findings are merely descriptive and should not be treated as causal.

Fig 24 at the bottom displays the number of participants from our sample that fall into each persona. This was determined by using the 'golden questions' from GfK's attitude-based segmentation research (see questions Q28-Q31 in Appenix D). All participants were asked to answer these as part of the demographic questions at the end of the online experiment.

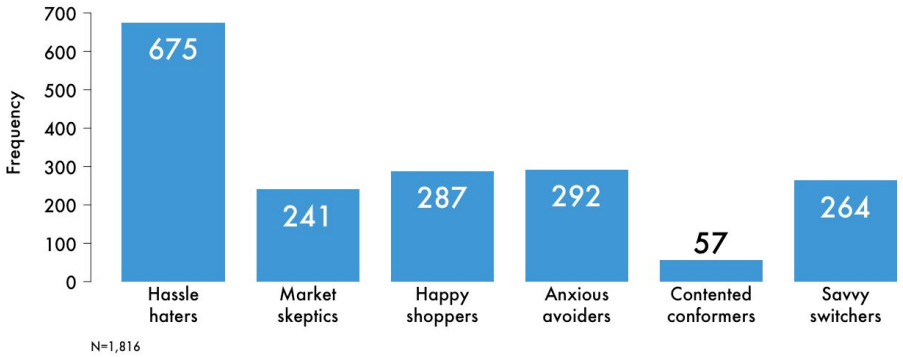
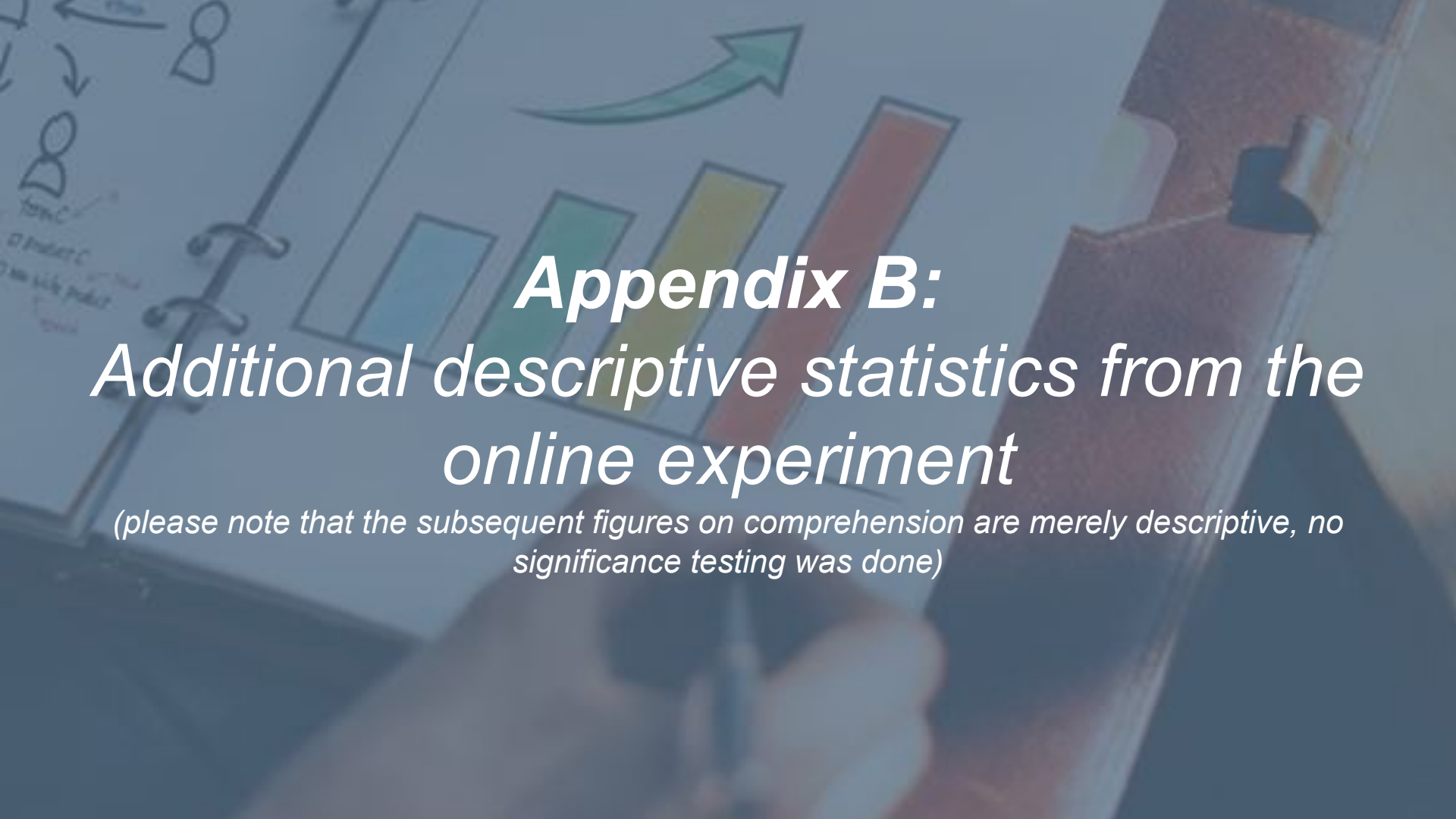


Fig.24 Number of participants who fall into each persona

	Control	P1: FAQ	P2: FAQ + Risk warning	P3: Triage + Visual
Hassle haters	53.6	51	53.1	50.5
Market skeptics	61.7	64.9	69.9	71.2
Happy shoppers	60.7	62.8	62.7	64.6
Anxious avoiders	51.2	48.5	54.2	50.8
Contented conformers	60.8	63.2	60.0	72.9
Savvy switchers	67.2	71.3	71.2	70.8

Table 2 Comprehension scores per control/ prototype across each persona

NB: With regards to the 'golden questions' of the segmentation, we had to rescale our response scale to Q28 and Q29 in order to match our response scale to that of the original segmentation GfK's research. Specifically, we rescaled 1 - 6 to 1 -7 for Q28 and 1-7 to 1- 5 for Q29.



Appendix B:
Additional descriptive statistics from the online experiment

(please note that the subsequent figures on comprehension are merely descriptive, no significance testing was done)

Best/ worst understood elements across secondary analysis

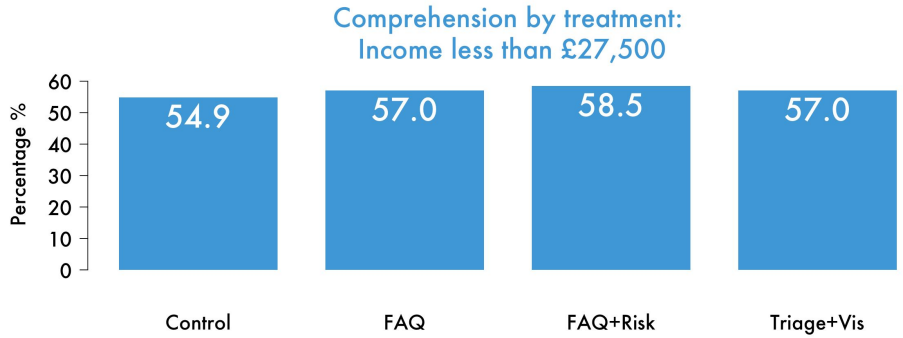
	Control	FAQ	FAQ + risk warning	Triage tool + visuals
Element that was least understood	Benefits & cost-benefit analysis (49.5%)	Cost-benefit analysis (41.3%)	Benefits (54.6%)	Cost-benefit analysis (46.1%)
Element that was best understood	Financial trade-off (70.9%)	Financial trade-off (72.2%)	Financial trade-off (65.8%)	Financial trade-off (73.0%)

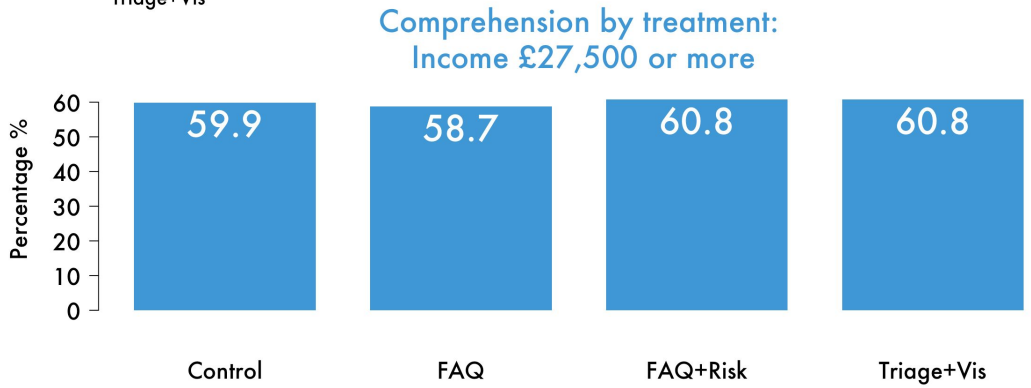
Comprehension of individual benefits

Mean comprehension score per question by control and treatment group

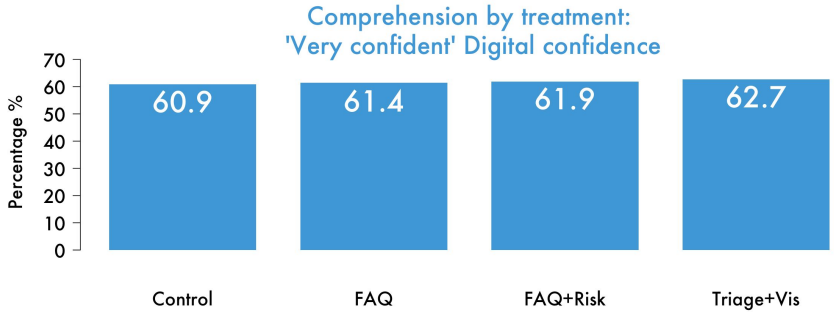
Comprehension question	Control	FAQ	FAQ + Risk warning	Triage tool + visual summary
2: All benefits, multiple responses	49.3	53.6	53.3	52.5
5: TOU tariff saving	60.9	61.8	63.7	65.6
6: Solar energy	67.1	62.7	64.7	64.9
8: Flexibility service	20.8	35.9	38.6	35.1

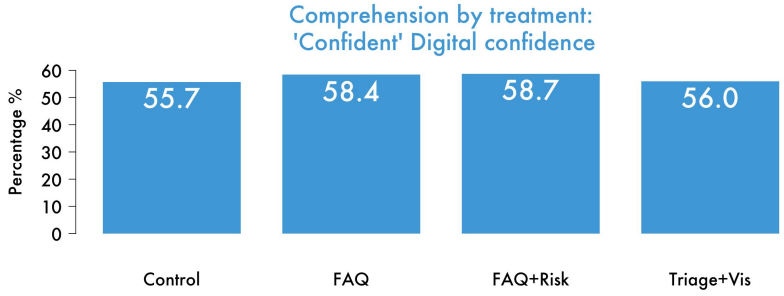
Comprehension levels per income group

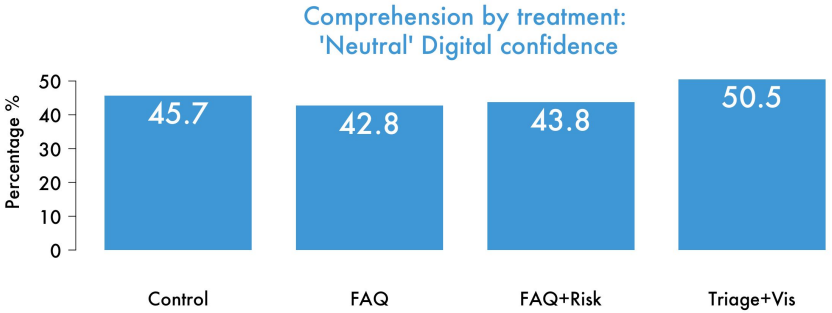


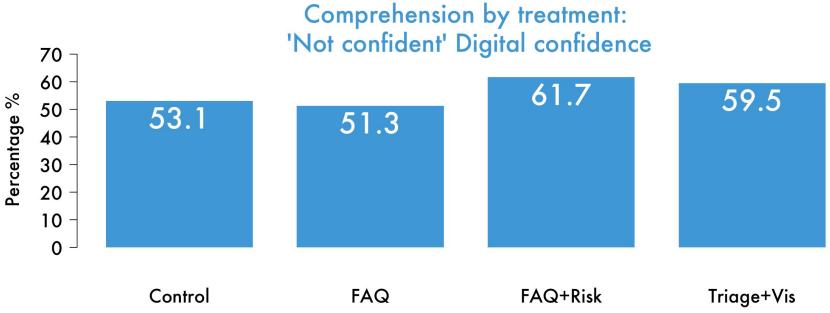


Comprehension per level of self-reported digital confidence









Additional covariates (1/2)

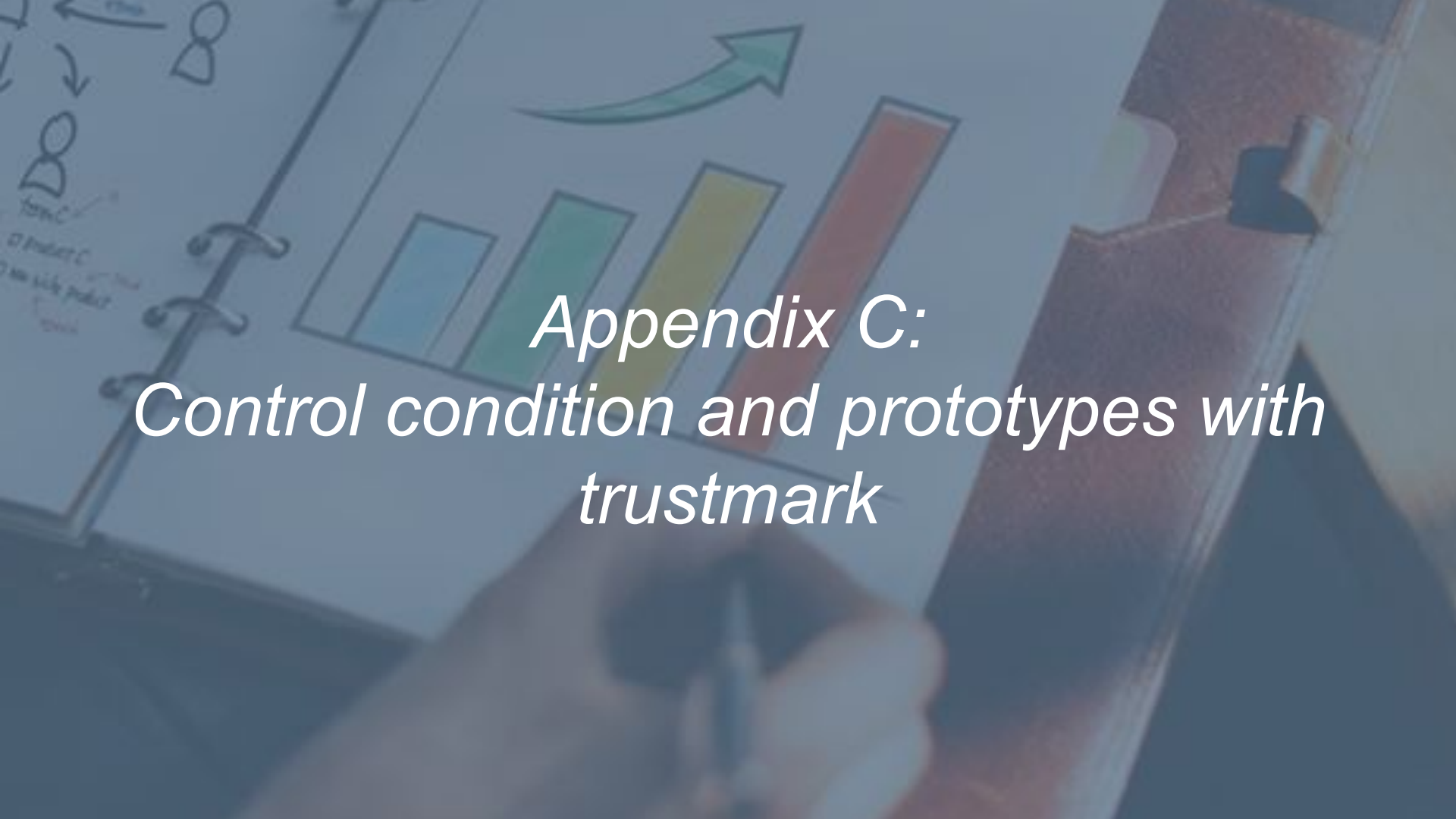
Ethnicity	
White	88
Other	12

Housing Status	
Own	63
Social Housing	17
Rent	18
Other	1
Geographical location	
Urban - Densely populated, city or large town	30
Suburban - Mainly residential, bordering a city or large town	50
Rural - Sparsely populated, small town or village	20

Other covariates (2/2)

Type of home	
Detached	22
Semi-detached	33
Terraced	22
Flat	21
Other	2
Number of bedrooms	
1	11
2	27
3	39
4	17
5	3
More than 5-bedrooms	1

Environmentally friendly	
I don’t really do anything that is environmentally-friendly.	4
I do one or two things that are environmentally-friendly.	26
I do quite a few things that are environmentally-friendly.	45
I'm environmentally-friendly in most things I do.	21
I'm environmentally-friendly in everything I do.	4



Appendix C: Control condition and prototypes with trustmark

Battery X - green living with intelligent battery storage

Battery X is a smart battery storage system. **Battery X** can help you reduce your electricity bills by storing electricity from your supplier when it's cheaper during off-peak times or by storing energy from your solar panels. As well as saving on your bills, **Battery X** can help you make money by letting an energy company use your **Battery X** to store or release electricity when the electricity system needs it. **Battery X** can store up to 6 kWh of energy - that's enough to power your kitchen appliances and TV for one evening as well as a laptop all day.

Note, to use **Battery X**, you'll need to have a smart meter and somewhere cool and dry to store it.

Battery X is a modular system so you can upgrade to **Battery X premium** any time for more capacity and performance. **Battery X** is built according to industry-recognised safety standards and can be setup by a technician.

Product details:

- Attach to solar to optimise your solar investment
- Use with time-of-use (TOU) tariff
- Modular system
- Access to grid balancing services

TRUSTMARK
Government Endorsed Quality

Battery X - green living with intelligent battery storage

Battery X is a smart battery storage system. **Battery X** can help you reduce your electricity bills by storing electricity from your supplier when it's cheaper during off-peak times or by storing energy from your solar panels. As well as saving on your bills, **Battery X** can help you make money by letting an energy company use your **Battery X** to store or release electricity when the electricity system needs it. **Battery X** can store up to 6 kWh of energy - that's enough to power your kitchen appliances and TV for one evening as well as a laptop all day.

Note, to use **Battery X**, you'll need to have a smart meter and somewhere cool and dry to store it.

How can Battery X help me reduce my electricity bill?

- First, you can store electricity directly from your energy supplier at times when it's cheaper, and then use it whenever you need it. Note, you'll need a 'time of use' tariff for this. A 'time of use' tariff is a tariff where the price varies at different times, e.g. it may be cheaper to use electricity at night and more expensive during the hours of the day when demand is high.
- Second, if you have solar panels you can store unused energy when it's being generated, and use it when you need it, for example when the sun isn't shining.

How can Battery X help me generate an income? To help the electricity system at busy times, you can sign up with an energy company who will pay you an income to lend part, or all of your **Battery X**'s storage capacity. Note, this may mean you cannot use this share of your battery for your own energy storage. This also means there is a financial trade-off between this income and the other benefits summarised above.

How can Battery X make my energy consumption greener? Battery X allows you to store electricity generated from your solar panels to use later. It can also help the entire system by storing renewable energy for the national grid at busy times or releasing electricity when it's needed. You can also set your **Battery X** to store electricity from the national grid when it is greenest.

TRUSTMARK
Government Endorsed Quality

Battery X - green living with intelligent battery storage

Battery X is a smart battery storage system. **Battery X** can help you reduce your electricity bills by storing electricity from your supplier when it's cheaper during off-peak times or by storing energy from your solar panels. As well as saving on your bills, **Battery X** can help you make money by letting an energy company use your **Battery X** to store or release electricity when the electricity system needs it. **Battery X** can store up to 6 kWh of energy - that's enough to power your kitchen appliances and TV for one evening as well as a laptop all day.

Note, to use **Battery X**, you'll need to have a smart meter and somewhere cool and dry to store it.

How can Battery X help me reduce my electricity bill?

- First, you can store electricity directly from your energy supplier at times when it's cheaper, and then use it whenever you need it. Note, you'll need a 'time of use' tariff for this. A 'time of use' tariff is a tariff where the price varies at different times, e.g. it may be cheaper to use electricity at night and more expensive during the hours of the day when demand is high.
- Second, if you have solar panels you can store unused energy when it's being generated, and use it when you need it, for example when the sun isn't shining.

How can Battery X help me generate an income? To help the electricity system at busy times, you can sign up with an energy company who will pay you an income to lend part, or all of your **Battery X**'s storage capacity. Note, this may mean you cannot use this share of your battery for your own energy storage. This also means there is a financial trade-off between this income and the other benefits summarised above.

How can Battery X make my energy consumption greener? Battery X allows you to store electricity generated from your solar panels to use later. It can also help the entire system by storing renewable energy for the national grid at busy times or releasing electricity when it's needed. You can also set your **Battery X** to store electricity from the national grid when it is greenest.

CAUTION

Smart storage batteries require an upfront investment that is not worthwhile for all households. The calculations surrounding this can be complex – involving your current solar generation, grid consumption, devices in your home, and your energy lifestyle.

TRUSTMARK
Government Endorsed Quality

Battery X - green living with intelligent battery storage

Battery X is a smart battery storage system. **Battery X** can help you reduce your electricity bills by storing electricity from your supplier when it's cheaper during off-peak times or by storing energy from your solar panels. As well as saving on your bills, **Battery X** can help you make money by letting an energy company use your **Battery X** to store or release electricity when the electricity system needs it. **Battery X** can store up to 6 kWh of energy - that's enough to power your kitchen appliances and TV for one evening as well as a laptop all day.

Step-by-step guidance:

1. **Is smart battery storage right for me?**

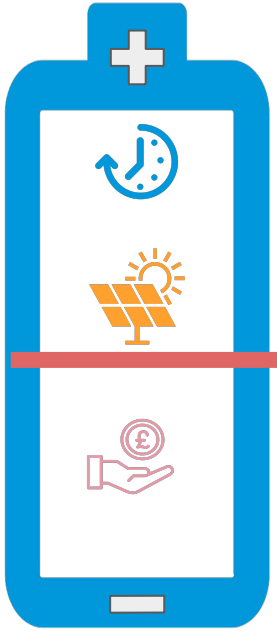
   Yes, if you:

   - ☑ Have a smart meter, and
   - ☑ Have a cool and dry place to install it

2. **Have you considered how you want to use Battery X? Smart battery storage is designed for a few different uses. In order to benefit from having one, you would need to have at least one of the following:**

   - ☑ A time of use tariff to store cheap electricity from your supplier. A 'time of use' tariff is a tariff where the price varies at different times, e.g. it may be cheaper to use electricity at night and more expensive during the hours of the day when demand is high.
   - ☑ Solar panels to store solar energy
   - ☑ Sign up to lend part or all of your Battery X's capacity to an energy company

You can use and benefit from y*our Battery X* in different ways:



Cheaper energy from your supplier. Reduce your energy bill by storing electricity directly from your energy supplier at times when it's cheaper, and then using it whenever you need it.

Solar energy. If you have solar panels you can store unused energy when it's being generated, and use it when you need it, for example when the sun isn't shining.

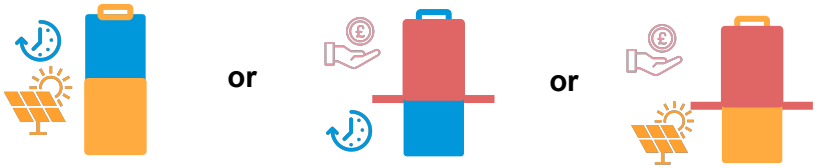
Capacity share lent to supplier in return for income. To help the electricity system at busy times, you can sign up with an energy company who will pay you an income to lend part, or all of your **Battery X**'s storage capacity. Note, this may mean you cannot use this share of your battery for your own energy storage. This also means there is a financial trade-off between this income and the other benefits summarised above.

Battery X can help reduce CO2 emissions, as it enables the national grid to use renewable energy sources more efficiently, and it allows you to use more electricity generated from your solar panels.

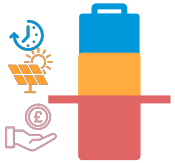
And you can combine your benefits in three different ways:

A - single use: Use your battery's full capacity for **one** of the three benefits.

B - dual use: Split your storage capacity between **two** benefits.



C - combined: Split your capacity between all three benefits.



TRUSTMARK
Government Endorsed Quality

Appendix D: Predictiv (online experiment) survey

Full participant instructions and survey

Q1. Who in your household makes decisions about which energy provider to use?

1. I am the sole decision-maker
2. I make decisions jointly with another person
3. Someone else makes all the decisions → *excluded*

[landing page]

Welcome and thanks for participating in this survey.

Task: In this exercise, we are going to ask you to think about a new technology. We're going to show you some information about a smart battery storage. We are then going to ask you some questions about the information you saw.

Duration: The survey should take about 10 minutes to complete and requires your attention, so please only participate if you can dedicate this time!

Payment: For some parts of the survey you can earn an additional reward.

This reward is in addition to what you get from completing the survey. You will receive this through your panel website shortly after completing the survey.

Please note you cannot go back to previous pages.

Full participant instructions and survey

[instructions]

On the next page, we will show you some information about a smart battery storage unit called, Battery X. We'd like you to read the information carefully. You can take as long as you need. We will then ask you some questions about your understanding of the information.

[estimation question]

Q2. Do you think Battery X could save you money?

1. Yes
2. No

[if yes] How much do you think Battery X could save you on your energy bill? Please give your answer as a percentage of your total energy bill.

Full participant instructions and survey

(Instructions)
The next 11 questions are about Battery X. Please choose the answer that you think is correct based on the information you saw. For each question you answer correctly, you will receive an additional reward.

Q3. [Basic definition] How does Battery X work?

a) It works as a way to store electricity to reduce your net energy costs
b) It works as a way to generate electricity that is cheap
c) It works as a way to transform electricity into other forms of energy such as heat

Q4. [All benefits] In what way(s) can Battery X financially benefit consumers? Tick all that apply:

a) You can use Battery X with your solar panels
b) You can benefit from a time of use tariff where the price for electricity varies
c) You can lend an energy company all or part of Battery X
d) You can reduce the overall amount of energy you are using

Q5. [Environmental benefit] Are there other, non-financial benefits associated with buying/using Battery X?

a) Improved energy efficiency
b) Environmental benefit
c) Heat efficiency
d) No - the benefits are only financial

Full participant instructions and survey

Q6. [Cost benefit analysis] What factors should you consider to assess if smart battery storage is right for you? Choose the most appropriate response:

a) You should carefully weigh the costs and benefits considering
   i) the upfront investment,
   ii) how you intend to use the battery
   iii) and the associated value of benefits

b) You should carefully weigh the costs and benefits considering
   i) the upfront investment,
   ii) how you intend to use the battery
   iii) how you use energy in your home
   iv) what requirements you might need
   v) and the associated value of benefits

c) You should carefully weigh the costs and benefits considering
   i) how you intend to use the battery
   ii) How you use energy in your home
   iii) what requirements you might need
   iv) and the associated value of benefits.

d) You should carefully weigh the costs and benefits considering
   i) how much income you might earn from renting your battery's storage capacity
   ii) and how much you could save on your energy bill by using your battery storage with solar panels and a time of use tariff.

Full participant instructions and survey

Q7. [ToU saving] If you have a time of use tariff (where the price for electricity varies), how can Battery X reduce your electricity bill?

a) Battery X can store electricity at a time when it's cheaper and use it during times when it's more expensive to buy new electricity from the grid.
b) Battery X can store electricity at a time when it's more expensive to buy and use it during times when it's cheaper to buy new electricity from the grid
c) Battery X can store electricity so you never run out.
d) Battery X can signal when electricity is cheapest and automatically switch on your smart appliances (e.g. dishwasher, washing machine) at that time.

Q8. [Solar energy] How can you use Battery X with your solar panels?

a) Battery X can replace your solar panels and self-generate solar energy for your personal consumption
b) Battery X can maximise the benefit of your solar panels by transforming solar energy into heat that you can use to heat your home
c) Battery X can maximise the benefit of your solar panels by allowing you to store excess solar energy that would go to waste otherwise
d) Battery X can reduce the benefit of your solar panels by storing excess solar energy that would otherwise be used immediately.

Full participant instructions and survey

Q7. [ToU saving] If you have a time of use tariff (where the price for electricity varies), how can Battery X reduce your electricity bill?

a) Battery X can store electricity at a time when it's cheaper and use it during times when it's more expensive to buy new electricity from the grid.
b) Battery X can store electricity at a time when it's more expensive to buy and use it during times when it's cheaper to buy new electricity from the grid
c) Battery X can store electricity so you never run out.
d) Battery X can signal when electricity is cheapest and automatically switch on your smart appliances (e.g. dishwasher, washing machine) at that time.

Q8. [Solar energy] How can you use Battery X with your solar panels?

a) Battery X can replace your solar panels and self-generate solar energy for your personal consumption
b) Battery X can maximise the benefit of your solar panels by transforming solar energy into heat that you can use to heat your home
c) Battery X can maximise the benefit of your solar panels by allowing you to store excess solar energy that would go to waste otherwise
d) Battery X can reduce the benefit of your solar panels by storing excess solar energy that would otherwise be used immediately.

Q9. [Solar panels] Do you think the following statement is true or false? *You need solar panels to make use of any of Battery X's benefits.*

a) True
b) False

Full participant instructions and survey

Q10. [Flexibility service] How can Battery X provide you with an income?

a) You can sign up with an energy company to pay you to access the electricity you stored in your Battery X.
b) You can sign up with an energy company to pay you to lend part or all of your Battery X's storage capacity to store electricity, but you wouldn't be able to use that electricity.
c) You can sign up with an energy company to pay you to lend part or all of your Battery X's storage capacity to store electricity that you could use.
d) You can sign up with an energy company to pay you to use your Battery X's capacity for research experiments.

Q11. [Financial trade-off] Do you think the following statement is true or false: *Your total financial benefit depends on the proportion of Battery X's capacity allocated to the respective use modes.*

a) True
b) False

Full participant instructions and survey

Q12. [Requirements] Which technical requirements do you need to have in your home to **benefit from Battery X in all the ways described in the product description**? Tick all that apply:

a) Smart meter
b) Time of use tariff or ability to switch to one
c) Dry and cool space to store the battery
d) Solar panels
e) Smart home appliances
f) Central heating powered by electricity
g) An empty room in your house
h) A cupboard to store the battery in
i) A centralised device that regulates all your smart home technology

Q13. [ToU-requirement] Do you think the following statement is true or false? *You don't need a time of use tariff to make use of **some** of Battery X's benefits.*

a) True
b) False

Full participant instructions and survey

[additional comprehension question]

Q14. [Fit for you] Having read about Battery X would you consider buying a smart battery for your home? Please explain your answer.

[free text response]

[trust]

Q15. How much would you trust the manufacturers to provide information truthfully and comprehensively about smart battery storage like Battery X when making a purchase from them?

(scale of 1 ‘not at all’ to 7 ‘completely’?)

Full participant instructions and survey

[engagement]

Q16. Click one the report below if you would like to know more about battery storage, their use, types, costs and benefits

[measuring click-through rate]

Full participant instructions and survey

[introduction to demographic questions]

Thanks for your answers so far! We are almost done. The next few questions are about you and your opinion. There are no right or wrong answers.

[demographic and additional questions]

Q17. [Trusted advisor] 'From who else - if anyone - would you want to get information about Battery X before purchase?'

- Friends and Family
- My energy supplier
- Which?
- Citizens Advice
- Money Saving Expert
- A professional electrician (!?)
- Other, please specify

Full participant instructions and survey

Q18. [Consumer advice] If you'd seek out more information on Battery X what kind of information would you be looking for?

- whether the product received a trustmark
- Whether the product has a warranty / guarantee
- who to call for maintenance / if things go wrong
- what your rights are in the if things go wrong
- More detail on the functionality of the device, i.e. the benefits and requirements

Q19. [Digital confidence] How confident would you be doing each of the following things?

1. Browsing social media
2. Accessing your bank account online
3. Using an app to control your heating
4. Buying or using voice assistant technology, like an Alexa
5. Buying or using a smart appliance, like a smart washing machine that automatically turns on when energy is cheapest

against a scale of *very confident / fairly confident / not very confident / not at all confident / neutral*

Full participant instructions and survey

Q20. [Ethnicity] What is your ethnic group? Choose one option that best describes your ethnic group or background.

1. White
2. Mixed/multiple ethnic groups
3. Asian/Asian British
4. Black/African/Caribbean/Black British
5. Other ethnic group

Q21. [ToU] Do you have a Time of Use Tariff? A 'time of use' is a tariff where the price may change based on when you use electricity, e.g. it may be cheaper to use electricity at night.

1. Yes
2. No
3. I'm not sure

Q22. [Solar panels] Do you have solar panels installed in your home?

1. Yes
2. No
3. I'm not sure

Full participant instructions and survey

Q23. [Smart meter] Do you have a smart electricity meter? A smart electricity meter is a new generation electricity meter being installed by energy suppliers. It comes with an in home display, which shows you how much electricity you are using in pounds and pence. It automatically sends meter readings to your energy supplier at least once a month, so you will receive accurate, not estimated bills.

1. Yes
2. No
3. I'm not sure

Q24. [Environmentally friendly] Which of these would you say best describes your current lifestyle?

1. I don't really do anything that is environmentally-friendly
2. I do one or two things that are environmentally-friendly
3. I do quite a few things that are environmentally-friendly
4. I'm environmentally-friendly in most things I do
5. I'm environmentally-friendly in everything I do

Q25. [Type of home] What type of house do you currently live in?

1. Semi-detached
2. Detached
3. Terraced
4. Flat
5. Other

Full participant instructions and survey

Q26. [Number of bedrooms] How many bedrooms does your current home have?

1. 1
2. 2
3. 3
4. 4
5. 5
6. More than 5-bedrooms

Q27. [Geographical location] What type of area best describes where you live? (For analysis: Urban = 1, 2; Rural = 3)

1. Urban – Densely populated, city or large town
2. Suburban – Mainly residential, bordering a city or large town
3. Rural – Sparsely populated, small town or village

Q28. [Housing status] Which of these applies to your home? (For analysis: 'own' = 1,2; social housing = 3, 5 and rent = 4)

1. It is owned with a mortgage
2. It is owned outright
3. It is rented from the local authority
4. It is rented from a private landlord
5. It is rented from a Housing Association/Trust
6. Other
7. Prefer not to say

Full participant instructions and survey

[Ofgem consumer segmentation - golden questions]

Now please think about how you like to shop around for major service providers or for major purchases (not just for energy).

Q28. To what extent do you agree or disagree with the following statements?

i. As soon as I see a problem or challenge I start looking for possible solutions
ii. I am able to follow through with things once I've made up my mind to do something
iii. I usually continue to search for an item until it reaches my expectations
iv. I am usually among the first to try a new product when it appears on the market
v. I always check bank or building society statements when I get them, including online

All answers: 1. Agree strongly 2. Agree 3. Agree slightly 4. Neither agree nor disagree 5. Disagree slightly 6. Disagree 7. Disagree strongly

Q29. And now thinking about energy specifically… to what extent do you agree or disagree with the following statements?

i. Price comparison websites all have the same energy deals on them
ii. Price comparison websites are unbiased in the way they display energy deals
iii. Switching is a hassle that I've not got time for
iv. If I was going to change energy supplier, I would look for a supplier who offered me extra rewards
v. I would be happy to pay slightly more for my energy if my supplier offered me better customer service

All answers: 1. Agree strongly 2. Agree 3. Agree slightly 4. Neither agree nor disagree 5. Disagree slightly 6. Disagree 7. Disagree strongly

Full participant instructions and survey

Q30. How confident or unconfident do you feel about doing things related to energy suppliers?

i. Comparing the different energy deals available

1: Very confident 2: Fairly confident 3: Neutral 4: Not very confident 5: Not confident at all

Q31. To what extent do you trust or distrust your energy supplier(s) to...?

i. Treat you fairly in their dealings with you

ii. Charge you a fair price for your gas and electricity

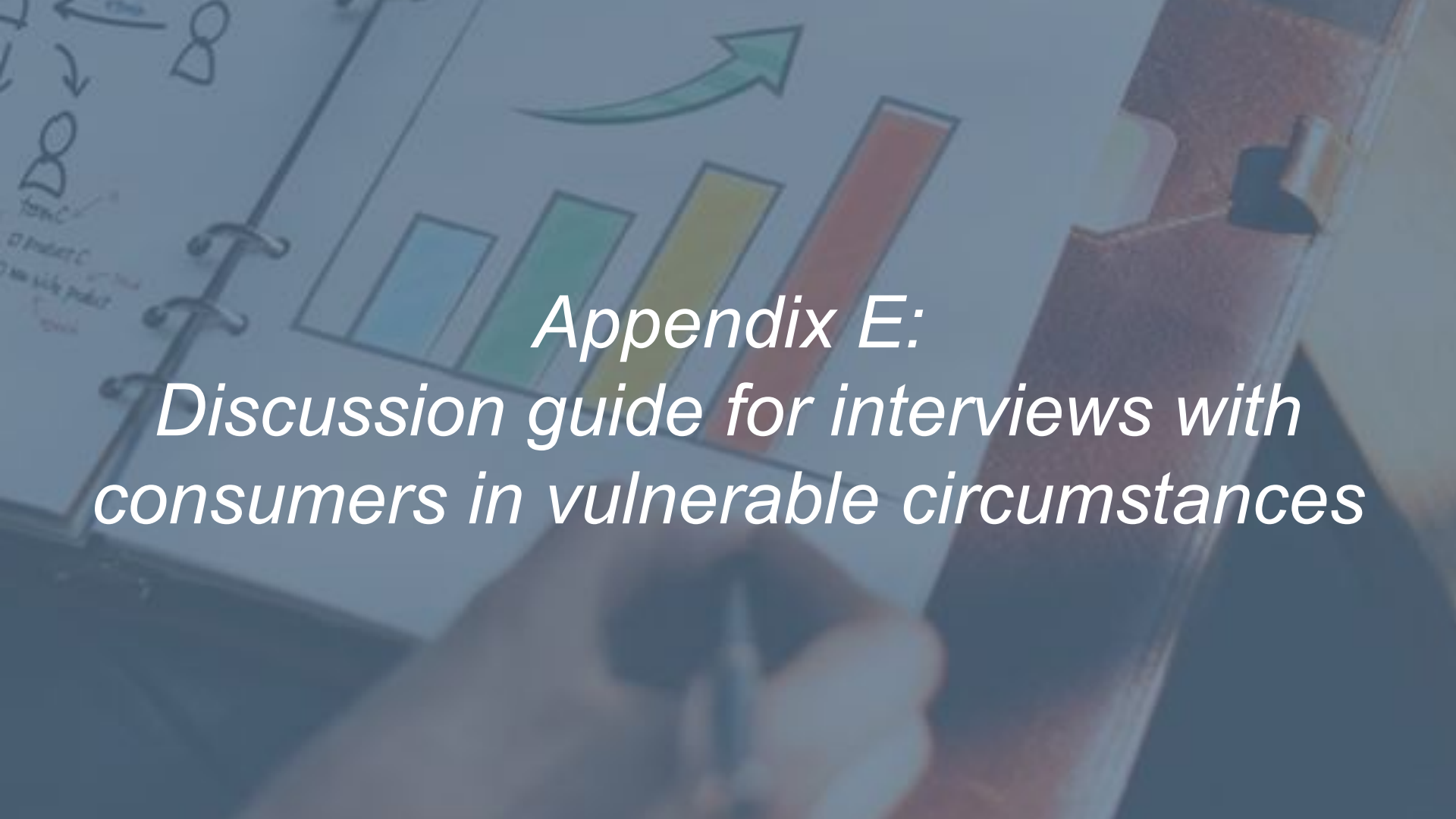
1: Completely trust 2: Tend to trust 3: Neither trust nor distrust 4: Tend to distrust 5: Strongly distrust

---

[thank you and information about payment]

This is the end of the survey. Thanks for participating! This survey tests whether the information we provided about smart battery storage helps people to understand their benefits and requirements for making the most of a smart battery. Please let us know if you have any feedback about this information - for example, whether you find it useful or confusing, or whether you think it should be changed.

[optional free text response]



Appendix E: Discussion guide for interviews with consumers in vulnerable circumstances

Discussion guide for interviews with consumers in vulnerable circumstances

[INSTRUCTIONS TO INTERVIEWER]

The interviews should last around 45 minutes. The timings given for each section are a guide - you may spend longer or shorter on each section. Lead questions are presented in bold, with potential follow-up questions presented in a non-bold typeface. As the interviews are semi-structured, not all questions need to be asked and they do not need to be asked in order. The interviewer should be responsive to what the interviewee says, following the direction of the conversation and following-up with additional questions as needed.

Discussion guide for interviews with consumers in vulnerable circumstances

Main objective	Purpose of section	Guide timings
1. Introduction	Explains the purpose and 'ground rules' of the flip tests and interview.	5 mins
2. Engagement with energy market	Background information to understand the participant's general engagement with the energy market.	5 mins
3. Understanding of smart home technologies	To find out what the participant's current understanding of smart batteries and smart home technologies is, and any experience they have of them.	5 mins
4. Flip Test	Time for participant to read the first set of information	5 mins
5. Comprehension of Flip Test	To understand what aspects of the information the participant understood, and which they found more difficult to understand.	15 mins
6. Getting information	To understand where and how participants would seek additional information on products and services, and how much attention they pay to consumer protections	8 mins
7. Close	Thank you and close	2 mins

Discussion guide for interviews with consumers in vulnerable circumstances

1. Introduction	5 minutes
Introduction: ● Introduce yourselves and BIT. **Aims of this interview:** We have been commissioned to do this interview by Citizens Advice, the statutory watchdog for energy consumers in the market. The purpose of the interview is to see how information helps you understand an energy technology called smart battery storage. We'll also ask you some questions about your knowledge and experience of energy and related technologies. **This interview:** ● Should take around 45 minutes ● Stress that you want to understand things from their point of view. No answers are right or wrong – and we are not here to judge the views held by the interviewee.	Prepares the respondent for taking part in the discussion. Outlines the 'rules' of the flip tests and interview.

Discussion guide for interviews with consumers in vulnerable circumstances

1. Introduction (continued)	5 minutes
Reiterate key points about the interview: ● All information gathered will be in strict confidence, unless there are concerns about the safety of you or someone else. We may use quotes from this interview, but these will be included in a way that means no one is identifiable from the reporting. *[Note, if there was immediate risk, we would contact emergency services. If risk was not immediate, we would contact relevant statutory body, e.g . local authority safeguarding board]* ● Explain that if at any point they feel uncomfortable or prefer not to answer a specific question they can just say so. ● Explain that it is their choice whether they take part in the interview and they can end the interview at any point, without giving a reason. ● Check if they have any questions about the interview. If they are happy to go ahead, obtain written consent.	Prepares the respondent for taking part in the discussion. Outlines the ‘rules’ of the flip tests and interview.

Discussion guide for interviews with consumers in vulnerable circumstances

1. Introduction (continued)	5 minutes
Recording ● Then, obtain verbal permission to begin audio recording. ● Once you have consent, start the audio recorder. ● State the interview number/participant ID.	Prepares the respondent for taking part in the discussion. Outlines the ‘rules’ of the flip tests and interview.

Discussion guide for interviews with consumers in vulnerable circumstances

2. Engagement with energy market	5 minutes
Can you tell me about the energy tariff you're on for your gas and electricity? ● What is the name of your energy provider? ● How long have you been with them? ● What do you think of your energy provider? **How did you choose your current energy tariff?** ● When did you switch to this tariff? ● [If they discuss switching in the last year] What were your reasons for switching? ● [If they don't know when or if it was a long time ago] What are your reasons for staying on the same tariff? ● How did you find the experience of choosing a supplier or tariff?	Background information to understand the participant's general engagement with the energy market.

Discussion guide for interviews with consumers in vulnerable circumstances

3. Understanding of smart home technologies	5 minutes
Have you ever heard of something called a smart battery? **[Move on to question below if they have not heard of it]** If they have heard of smart batteries: ● Can you tell me a bit about what a smart battery does? ● What are your thoughts about smart batteries? Probe for ideas about **the benefits [probe for financial and environmental]** and risk of smart batteries. ● Can you tell me about any experience you have of using smart batteries? **What does the term 'smart home technology' mean to you? [Move on to 3 if they have not heard of it]** If they have heard of the term: ● Can you name any types of smart home technology? ● What do you think of smart home technologies? Probe for ideas about **the benefits [probe for financial and environmental]** and risks of smart home technologies. ● Can you tell me about any experiences you have of using smart home technologies? [probe for smart speaker (e.g Google Home/ Amazon Echo), smart thermostat or lightbulbs]	To find out what the participant's current understanding of smart batteries and smart home technologies is, and any experience they have of them.

Discussion guide for interviews with consumers in vulnerable circumstances

3. Understanding of smart home technologies (continued)	5 minutes
If they have not heard of the term: Smart home technologies include things such as smart speaker (e.g Google Home/ Amazon Echo), smart thermostat or smart lightbulbs. Have you heard of any of those? ● If no: move on to next question ● If yes: what do you know about X? ● Can you tell me of any experiences you have of using X? ● What did you think of X? [Probe for benefits and drawbacks]	To find out what the participant's current understanding of smart batteries and smart home technologies is, and any experience they have of them.

4. Flip test	5 minutes
Researcher gives the participant the first flip test screener and asks the participant to read the information.	

Discussion guide for interviews with consumers in vulnerable circumstances

5. Comprehension (Flip Test)	15 minutes
Can you describe what you understood from this information? **What do you understand about what Battery X does?** **What do you think the benefits of Battery X are?** ● [only probe on specifics for 'treatment screener'] Can you tell me about any other benefits? [Probe until they have said i) storing excess/unused solar energy ii) lending your battery's capacity to your supplier who will pay you an income in exchange iii) storing electricity when it is cheaper at off-peak times, so that you can use this energy at peak times when it would otherwise be more expensive **or they have no more answers**] ● [only probe on specifics for 'treatment screener'] And if you lend your battery to your supplier and receive an income in exchange, what would that mean for your own use of the battery?	To understand what aspects of the information the participant understood, and which they found more difficult to understand.

Discussion guide for interviews with consumers in vulnerable circumstances

5. Comprehension (Flip Test) (continued)	15 minutes
What do you need to have in order to use Battery X? ● [only probe on specifics for 'treatment screener'] Can you tell me about anything else you need? [Probe until they have said i) smart meter ii) having/switching to a time-of-use tariff iii) appropriate (cool and dry) storage space, **or they have no more answers**] ● What would the risks be to you if you purchased this product without reading the information or fully understanding it? **What do you think they mean by the following terms [point to where it is in the information]?:** - Off-peak - 'time of use' tariff - Kwh **How did you find reading that information?** ● How easy or difficult did you find the information to understand? ● Can you tell me about any parts you found harder to understand? ● Can you think of anything that could be changed to make the information clearer? **How do you think a smart battery could benefit you personally, if at all?**	To understand what aspects of the information the participant understood, and which they found more difficult to understand.

Discussion guide for interviews with consumers in vulnerable circumstances

6. Getting information	8 minutes
Before buying a product such as a laptop or home appliance, what information do you want to know about that product? ● Where would you usually go to for that information? ● What are your reasons for choosing these sources of information? ● If you needed additional information, which sources would you use? Why is that? **Which sources of information (e.g. reviews and recommendations) do you tend to trust when buying these kinds of products? organisations do you find most trustworthy?** ● [probe for Which?, Moneysavingexpert, other online reviews, Citizens Advice, family & friends] ● Why is that?	To understand where and how participants would seek additional information on products and services, and how much attention they pay to consumer protections

Discussion guide for interviews with consumers in vulnerable circumstances

6. Getting information (continued)	8 minutes
What information, if any, would you seek out in terms of your rights as a consumer? [warranty, return policies, data sharing, etc.] **What consumer protections do you feel you need if you bought the product? This could be things such as guarantees, warranties or return policies.** ● Why does/does this not matter to you? **Can you tell me about any recent experiences you've had where a technical product (if needed probe for laptop or white appliance) was explained to you clearly?** ● What was it about the explanation that you were given that you found particularly clear?	To understand where and how participants would seek additional information on products and services, and how much attention they pay to consumer protections

Discussion guide for interviews with consumers in vulnerable circumstances

7. Close	2 minutes
Was there anything else that you were hoping to discuss that we haven't yet had a chance to talk about? Thank the interviewee for their time and reassure them of the confidentiality of their responses, as explained at the beginning of the interview.	Thank you and close

Appendix F: Evidence review

Effective information provision on smart home appliances

A review of the evidence base

February 2019

THE BEHAVIOURAL INSIGHTS TEAM

In partnership with

Cabinet Office

Executive summary

Smart home technology has the potential to transform people's lives, and the energy sector, for the better. However, consumer understanding of the benefits and requirements of new products is crucial to ensure that consumers are empowered and protected when they take up this technology. Citizens Advice commissioned the Behavioural Insights Team (BIT) to undertake a review of the existing evidence on techniques to increase consumer comprehension of product information. While the main focus is on comprehension, this review also briefly summarises existing evidence on consumer trust, recognising that consumers must trust information as well as comprehend it. The findings of this review will feed into the design of 'prototypes' of information provision about one smart home technology-- smart batteries. The prototypes will be tested for consumer comprehension in a subsequent online experiment.

On comprehension: When phrasing information, effective techniques include providing only essential information, displaying numbers in practical units, harnessing loss aversion to engage consumers with financial information, making the information relatable to the consumer's daily lives, and making future cost savings feel more immediate. When styling and formatting the presentation of information, effective techniques include using categorical labels, standardising formatting, including all information on a single page, presenting information visually, employing 'stop signs', and providing information when it is most relevant to the consumer.

On trust: We found that both the source and context of information affects consumers' levels of trust. Techniques for presenting information to build trust include designing professional websites, avoiding the appearance of marketing or 'upselling', and presenting information in a simple and relatable way. We found that consumer organisations, governments, suppliers, and social networks all have the potential to be effective messengers. Overall, the evidence suggests that it is very context- and product- specific who the most effective messenger may be.

Introduction

Background and policy context

The energy sector is changing and consumers are faced with a rising number of new and difficult choices. With the accelerating proliferation of smart meters, take-up of smart home technology is expected to increase significantly in the UK, including that of smart batteries. Citizens Advice aims to establish good practices in product information communication for this emerging industry. As we know from the behavioural science literature, comprehension of information is not necessarily sufficient to incite action. Even when consumers understand the benefits of smart batteries, and understand how to use them, they still may not take action to purchase and correctly install them. While good comprehension of and high trust in product-related information may not necessarily promote or discourage purchase of smart home technology, they are integral to Citizens Advice's mandate to ensure that consumers are equipped with the necessary guidance to make the best decisions for themselves.

To achieve this goal, Citizens Advice seeks to produce best practice guidance on how information can be phrased, styled and formatted, and delivered to maximise consumer comprehension of the benefits and requirements of use for products.

Citizens Advice has engaged the Behavioural Insights Team (BIT) to understand consumer comprehension and highlight good practices of effective information provision in this context.

To that end, we first perform a review of existing evidence on consumer comprehension of product information and trust [enclosed]. We use the findings of this review to inform the design of multiple 'prototypes' of smart battery information, which are then tested using online Randomised Controlled Trials (RCT) with the general population, as well as light-touch qualitative research with vulnerable consumers.

Scope and structure of the evidence review

This review is structured around the two key themes explored in this research, namely 'comprehension' of and 'trust' in information. First, we survey the research on consumer comprehension, which is the main focus of this project. Second, we include a brief review of the research on consumer trust. This review focuses on empirical studies. It draws on the wider academic literature as well as BIT's in-house evidence from a number of online experiments assessing information comprehension.

Comprehension

THE
BEHAVIOURAL
INSIGHTS
TEAM

Comprehension of information

From awareness to installation, the consumer journey to take-up a new technology is complex. Citizens Advice is committed to empowering and protecting consumers throughout this journey; as such, it recognises the importance of consumer comprehension of key product information. Consumers cannot be empowered to make the best decision about technology take-up unless they understand the benefits of a product, as well as how to use it. This review seeks to summarise the evidence on effective methods for facilitating consumer comprehension.

For the purposes of this review, we define comprehension to mean that consumers correctly understand the information that is presented and are able to accurately apply the information. Comprehension can be measured empirically by asking consumers to answer multiple choice questions about information they have viewed, or to differentiate between products based on that information. We limit this review to research that directly measures comprehension using these methods, as opposed to research that tries to infer consumer comprehension from consumer choice.

We organise techniques for improving consumer comprehension using BIT's 'EAST' framework (outlined on slide 7). We further categorize techniques as either 'phrasing' or 'style/formatting'. 'Phrasing' techniques cover how a website or document explains a product's attributes, while 'style/formatting' techniques involve the delivery method, structure, and display of information.

Summary of findings		
EAST	**Phrasing**	**Style/Formatting**
Easy	Include only essential information Display numbers in practical units (avoid percentages)	Use categorical labels with summary statistics/grades Standardise formatting to allow for comparisons Include all necessary information on a single screen/page
Attractive	Harness loss aversion	Present information visually Use eye-catching 'stop signs' to signal products to avoid
Social	Make information relatable to the consumer	
Timely	Make future cost savings feel more immediate	Provide information when it is most relevant to the consumer

Comprehension: The ‘EAST’ framework

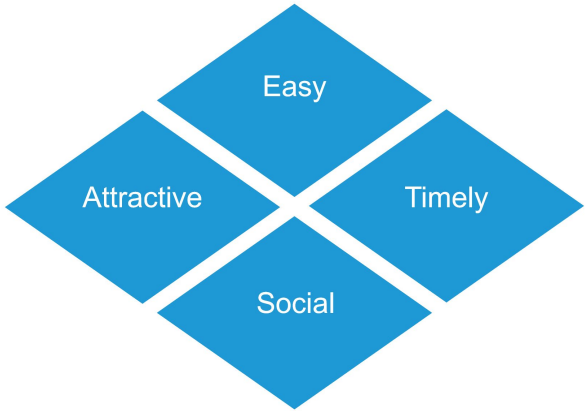
Easy – reduce the required effort: A major lesson from the behavioural science literature is the strong effect of 'friction'-- the small, seemingly irrelevant details that make a task more challenging or effortful (BIT, 2014). Comprehension is a mental task, and we can make it easier for people by reducing the amount of effort that an individual needs to exert in order to correctly understand and apply information.

Attractive – make it appealing: In the field of behavioural science, making something 'attractive' means drawing attention to it and making it more appealing. Making information attractive can drive comprehension in two ways: 1) it makes people engage with information when they might not otherwise have done so, and 2) it motivates people to put in the effort required for comprehension.

Social – leverage our social natures: Behavioural scientists have found that people are heavily influenced by social connections. We like to align our behaviour with those around us, and are motivated by our desire to create and maintain relationships. These goals can motivate people to engage with information they consider relevant for improving social connections and therefore comprehend it better.

Timely – target the right moment: People’s thoughts and behaviours are influenced by the ideas and items they experience from moment to moment. This means that people respond differently to information depending on when they receive it. We can use behavioural insights to deliver information in formats and at times that are most conducive for comprehension.

The following slides highlight key findings and strategies for each of the EAST categories in more detail:



Easy: Reduce the required effort

1. Simplification: 'Information overload' refers to the concept of receiving so much information that our brains struggle to process and sort it. Research has found that providing individuals with more information only improves performance up to a certain point and that if additional information is provided beyond that point, performance rapidly declines (Eppler & Mengis, 2004). Information overload can cause cognitive strain and stress, and the inability to process information effectively to make a 'good' decision. The nature of information presented, such as its complexity or intensity, can also contribute to information overload. 'Simplifying' refers to the process of presenting information in a way that reduces information overload.

1.1 Shortening [phrasing]: Presenting only the most relevant information, is an effective way to decrease information overload and increase consumer comprehension. Peters et al. (2007) investigated whether deleting less important information from hospital quality comparison tables increases comprehension. The researchers found that doing so increased the number of questions about hospital quality that participants were able to answer correctly.

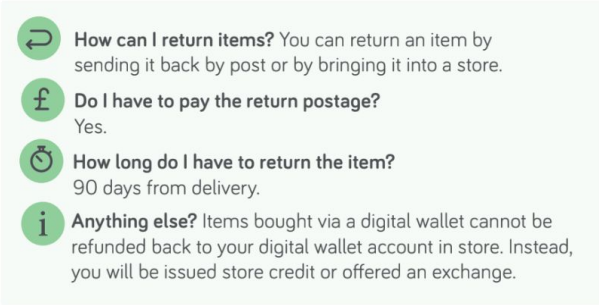
The Department of Business, Energy and Industrial Strategy (BEIS) commissioned BIT to create a Best Practice guide to improving consumer understanding of contractual terms and privacy policies.

BIT conducted a literature review of existing evidence and used online lab testing to test 18 techniques to increase engagement and understanding of these complex policies, the results of which will be published in 2019 (BIT, 2019 forthcoming). The academic literature and BIT's online tests revealed 5 techniques with strong experimental evidence for consumer comprehension of terms and policies, which are covered throughout this literature review. In one experiment, we found that pulling out and highlighting key terms in a variety of formats improved consumer understanding in comparison to presenting the full text of the policies. (see next slide for examples)

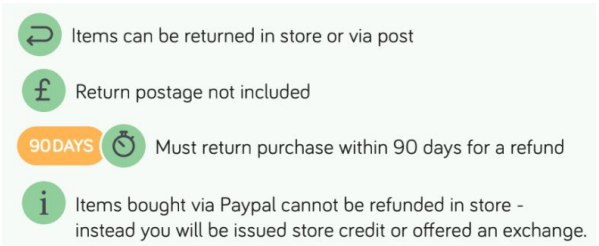
Separately, in a recent online experiment by BIT and Money Advice Service (BIT, 2018a), we found that reducing the information on a credit card application webpage into 4 or 6 key facts increased the average number of correct answers about balance transfer from participants.

Easy: Reduce the required effort

BIT (2019, forthcoming) BEIS Improving consumer comprehension of online contractual terms and privacy terms: Reformatting key terms as a Q&A


How can I return items? You can return an item by sending it back by post or by bringing it into a store.
Do I have to pay the return postage? Yes.
How long do I have to return the item? 90 days from delivery.
Anything else? Items bought via a digital wallet cannot be refunded back to your digital wallet account in store. Instead, you will be issued store credit or offered an exchange.

BIT (2019, forthcoming) BEIS Improving consumer comprehension of online contractual terms and privacy terms: Reformatting key terms as bullet points


Items can be returned in store or via post
Return postage not included
90 DAYS
Must return purchase within 90 days for a refund
Items bought via Paypal cannot be refunded in store - instead you will be issued store credit or offered an exchange.

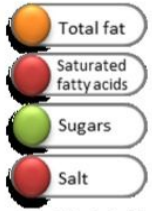
Using fewer words to communicate concepts can be effective, as long as shortening the text does not affect clarity. Shortening text has been shown to increase consumer understanding of terms and conditions and privacy policies and is considered a best practice in the field (Harris, 2013; Grannis, 2014). BIT worked with the Bank of England (BoE) (Bholat, D. et al., 2018) to test the impact of different approaches to presenting the Bank's Inflation Report. We found that shortening the amount of text used to explain the policies and inflation's impact by 50% increased participant comprehension scores above and beyond reformatting the policy summary into a visual summary. In another experiment (n=48), legal documents with simplified words and sentence structures yielded higher comprehension than the original documents (Masson & Waldron, 1994).

Easy: Reduce the required effort

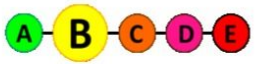
1.2 Categorical labels [style/formatting]: **Simplifying information into categories reduces the amount of information readers must process.** Studies have shown that using categorical labels, such as stars or letter grades, leads to better comprehension than using continuous scales to present information (Loewenstion, Sunstein, & Golman, 2014). A mixed methods evaluation of the US's EnergyGuide label for appliances found that a categorical, stars-based system out-performed the existing label, which displayed several statistics about the appliance (Thorne & Egan, 2002). The stars-based system was easily understood and correctly communicated appliance energy consumption.

Using a single summary metric has also been shown to improve comprehension. France's 'Nutri-Score' label, which assigns a categorical letter score (A-E) and colour (green to red) to foods has proven extremely successful in terms of consumer understanding of health food choices (Egnell, et al., 2018). The 'Nutri-Score' label has outperformed labels that provide more information both in terms of consumer preferences (Peneau et al., 2017) and improvements in the nutritional quality of items purchased (Dubois et al., 2018).

Ducrot et al. 2015: Categorical nutrition labels



Multiple Traffic Lights (MTL)



5-Color Nutrition Label (5-CNL)

Easy: Reduce the required effort

At the extreme, **distilling information into a single 'kitemark' can make it easy for people to understand which products are recommended** without having to interpret, or even read, more than one piece of information. A survey study of French adults found that a Tick label was more effective than detailed nutritional labels for helping respondents correctly rank products by nutritional content, but less effective than categorical labels (Ducrot et al. 2015).
Experimental studies that measure consumer choice support the fact that kitemarks are more effective than complex labels, but less effective than categorical labels (Cecchini & Warin, 2016; Ducrot et al., 2016). There is a risk that unfamiliar kitemarks may be misinterpreted to indicate quality when they do not.

Ducrot et al. 2015: Kitemark

Green Tick (Tick)

1.3 Display numbers in relevant units [phrasing]: The literature shows that people find performing calculations a significant source of friction, i.e. hassle. In a BIT experimental evaluation of energy plan overviews, nearly 90% of respondents were unable to correctly calculate what a consumer would pay for a single day of electricity (BIT, 2018b). **Presenting numbers in relevant units for decision-making (e.g. the amount that a new tax will cost per paycheck) removes the friction of performing calculations.** In an experimental study, BIT evaluated how different features of energy bills affected consumer comprehension (BIT, 2018c). One finding from this series of work was that respondents were substantially better at correctly identifying their potential savings from competing offers when the bill explicitly presented the amount they would save annually from each offer, instead of presenting the total annual cost of each offer. In BIT's and BoE's experimental study of Bank of England Inflation Report summaries and comprehension (see slide 9), explaining inflation in terms of the price changes of holidays abroad or of a £100 basket of goods may have contributed to improving comprehension. There is also evidence that calorie information on food packaging should be presented on a per package or per serving basis rather than a per 100g basis, which consumers may find confusing (Hawley et al., 2013).

Easy: Reduce the required effort

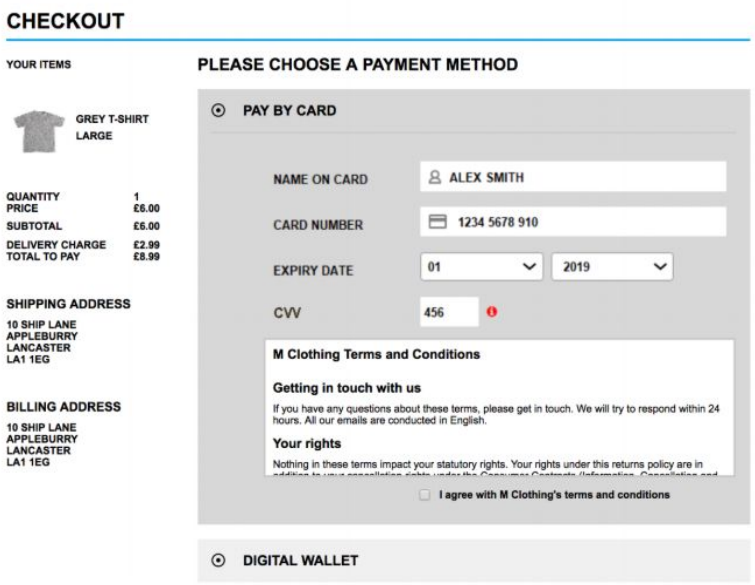
Numbers presented in percentages are specifically difficult for people to comprehend. There is evidence that displaying numbers in natural numbers instead of percentages increases comprehension in medical contexts (Ahmed et al., 2012; Hoffrage et al., 2000). It also appears to be effective in personal finance contexts. In an experiment with a national chain of payday loan stores, researchers found that translating the Annual Percentage Rate into the costs of the loans in dollars over time (i.e. 1 month, 2 months, etc.) reduced the likelihood of borrowing in the future by 10% (Bertrand & Morse, 2011). In an experiment in Mexico, researchers found that workers (especially those who were financially illiterate) selected funds with lower average fees when the fees were presenting in pesos instead of annual percentage rates (Hastings & Tejeda-Ashton, 2008). In 2018, BIT conducted an online experiment to determine the best way to display foreign currency exchange rates and fees (BIT 2018d). We found that study participants were most likely to identify the cheapest option when the interbank exchange rate and overall transaction cost were displayed in cash terms. In another randomised online experiment, BIT tested different ways to present company gender pay gap information on behalf of the Government Equalities Office (Hacohen, Wittels, & Mohan, 2018). Out of four treatment conditions, only the treatment that presented the pay gap in pound units (as opposed to percentages, as in the other treatment conditions) increased the number of comprehension questions respondents were able to answer accurately.

2. Standardized formats [style/formatting]: Comparing options to each other is a process rife with 'friction' when information is not standardised. According to Loewenstein, Sunstein, and Golman (2014), if information is not presented in a way that allows comparisons, people might not do the cognitive work to enable them to make comparisons on their own. **Using a standardised format to display the benefits and requirements of certain smart batteries could help consumers understand the requirements and compare policies to each other.** Standardising the format of information has proven effective in many fields (Loewensten, Sunstein, & Golman, 2014), including consumer policies. A standardised 'nutrition label for privacy' developed by Carnegie Mellon's CyLab Usable Privacy and Security Laboratory increased comprehension of privacy policies (Kelley et al., 2010; 2009). The Danish Competition and Consumer Authority (2018) designed a summary box for retail websites and tested the redesign against retailers' current presentation. The standardised summary increased the mean number of correctly answered comprehension questions by 36% among participants.

Easy: Reduce the required effort

3. Fewer clicks [style/formatting]: 'Friction costs' can refer to physical as well as cognitive effort. **People may be more likely to comprehend information when it is physically or cognitively less effortful to consume it.** As part of BIT's series of work on improving consumer comprehension of online terms and conditions (see slide 9), BIT found that displaying terms and conditions in a scrollable text box instead of a separate link increased the average number of comprehension questions participants were able to answer correctly.

BIT (2019, forthcoming) BEIS Improving consumer comprehension of online contractual terms and privacy terms: 'Scrollable' terms and conditions treatment



Attractive: Make it appealing

1. Images, diagrams and animation [style/formatting]: People respond to stimuli that are 'salient'-- those that are novel, simple and accessible. **Presenting information visually has been shown to improve comprehension of many types of information.** Diagrams have been shown to increase the speed and number of valid conclusions in study participants' responses (Bauer & Johnson-Laird, 1993), although improvements are sensitive to context and the specifics of graphical displays (Scaife & Rogers, 1996). Graphics increased customers' understanding of car finance contracts (McElvaney et al. 2018) and civil servants' understanding of legal instructions (Passera, Kankaanranta, & Louhiala-Salminen, 2017). As part of BIT's series of work on improving consumer comprehension of online terms and conditions (see slide 9), we found that summarising key terms and illustrating them with explanatory icons increased understanding by 34%.
Comics and illustrations to explain step-by-step actions and processes have been found to give context and emotional cues to facts, dates, and figures. Researchers developed a comic to explain how to cancel a credit agreement. Showing the comic to buyers of pre-owned vehicles increased the buyers' scores on questions about the process from 78% to 96.7% (Botes, 2017). In BIT's and BoE's experimental study of the Bank of England Inflation Report (see slide 9), we found that a visual summary of the report significantly outperformed the existing policy summary. The visual summary, which used simpler language and graphics to communicate the report content, improved participant's comprehension scores by 25%.

Botes, 2017: Credit agreement cancellation process comic

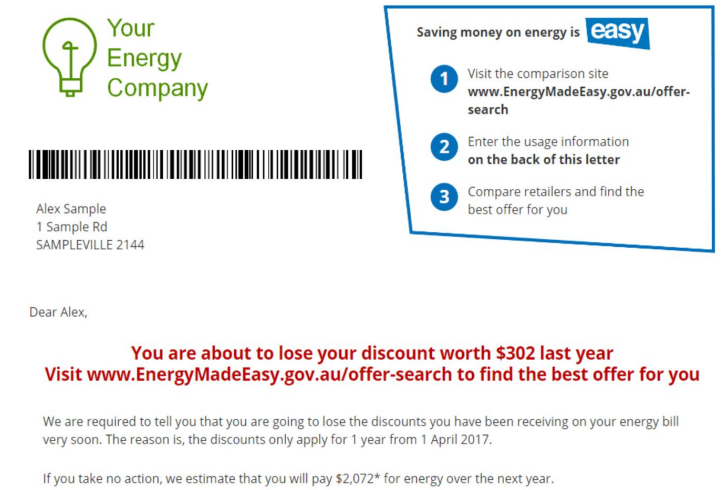
CONGRATULATIONS! YOU'VE BOUGHT A PRE-LOVED CAR.
WITH FINANCING APPROVED BY THE BANK AND THE INSTALLMENT SALE AGREEMENT SIGNED.
THE WORLD AWAITS!
BUT LATER ON...
MOONLIGHT CAR DEALER
DRIVE SAFE!
HOW TO TERMINATE A PURCHASE AGREEMENT
TERMINATE AGREEMENT WITHIN 5 BUSINESS DAYS AFTER DATE OF SIGNING THE AGREEMENT. BY FOLLOWING THESE 2 STEPS:
STEP 1
DELIVER WRITTEN NOTICE OF TERMINATION TO THE BANK THAT APPROVED THE FINANCING.
STEP 2
RETURN THE BROKEN DOWN VEHICLE TO DEALERSHIP
USED VEHICLES

Attractive: Make it appealing

3. Harness loss aversion [phrasing]: 'Loss aversion' refers to the theory that losses and disadvantages have greater impact on an individual's preferences than gains and advantages (Tversky and Kahneman, 1991). **There is evidence that harnessing loss aversion can lead to better understanding of content related to the implied loss.** BIT worked with the Australian Energy Regulator (AER) to conduct three online experiments to test different versions of a proposed benefit change notification (BIT, 2018e). We found that including a headline telling respondents that they would 'lose [their] discount' led to higher comprehension of the content of the notice related to costs, likely because the implied loss is more effective at capturing people's attention. However, the headline did not improve performance on comprehension questions not related to costs.

2. Stop signs [style/formatting]: We are more likely to engage with something that our attention is drawn towards (BIT, 2014). **Stop signs are more effective at catching consumer attention than more detailed labelling systems, and facilitate comprehension of poor quality products.** A 2017 evaluation of the Chilean stop sign system for food packaging found that the stop sign format was more effective than a multiple traffic light format in generating correct perceptions around unhealthy products (Arrua et al., 2017). A recent visual search task study found that stop signs made it easier for participants to identify unhealthy products compared with categorical labelling systems (Ares et al., 2018). However, in both studies, the stop sign system underperformed to categorical labelling systems in terms of participants identifying healthy products. Therefore, a stop sign system would be best for helping consumers understand which smart battery products not to buy, and less helpful for helping them distinguish between products.

BIT (2018e) AER Review of the Benefit Change Notice: 'Loss aversion' treatment


Your Energy Company
Saving money on energy is easy
1 Visit the comparison site www.EnergyMadeEasy.gov.au/offer-search
2 Enter the usage information on the back of this letter
3 Compare retailers and find the best offer for you
Alex Sample
1 Sample Rd
SAMPLEVILLE 2144
Dear Alex,
You are about to lose your discount worth $302 last year
Visit www.EnergyMadeEasy.gov.au/offer-search to find the best offer for you
We are required to tell you that you are going to lose the discounts you have been receiving on your energy bill very soon. The reason is, the discounts only apply for 1 year from 1 April 2017.
If you take no action, we estimate that you will pay $2,072* for energy over the next year.

Social: Leverage our social natures

1. Relatability [phrasing]: A common strategy in behavioural science is 'personalisation'—tailoring messages to the recipient, which make it easier for the recipient to imagine the costs and benefits of a particular action (i.e. 'what this means for me'). **When personalization is not possible, making information 'relatable' to the reader may accomplish the same goal**. In BIT's and BoE's experimental study of the Bank of England Inflation Report (see slide 9), we tested a condition that made the content of the report relatable to the reader by increasing the use of first and second person pronouns (e.g. 'us'/'you'), using more day-to-day words in place of more technical ones, embedding an interactive chart that invited participants to find out about unemployment in the region in which they reside, and focusing on topics that had been identified as resonating most with readers. The combination of these 'relatability' treatments improved mean comprehension scores among participants above and beyond providing the summary in a visual format and reducing the amount of text used.

Bholat, D. et al., 2018: Images from the 'relatability treatment' Inflation Report

What we do at the Bank of England
At the Bank of England, we set interest rates to support the economy. We try to make sure that the prices you pay don't rise more than 2% per year.
For you that means...
A basket of goods and services that cost you £100 this year...
2018 RECEIPT
£100
2019 RECEIPT
£102
...should cost you £102 next year
This time we decided to keep interest rates at 0.5%.

Timely: Target the right moment

1. Discounting [phrasing]: Standard economic models assume that people discount future benefits at a constant rate over time (Camerer & Loewenstein, 2002). However, behavioural scientists have discovered the 'present bias' —people weigh immediate costs and benefits disproportionately higher compared to those in the future. **One major barrier to investment in green technology is the tendency to focus on present costs and de-emphasise future savings.** BIT ran a trial with the Department of Energy & Climate Change (DECC) (now Department for Business, Energy & Industrial Strategy, BEIS) and John Lewis to encourage the purchase of more energy-efficient appliances (DECC, 2014). The intervention aimed to counter present bias by designing a new label for appliances that made lifetime running costs more salient at the point of sale. We found that washer-dryers bought in stores with new labels consumed on average 6.64 kwh/year less (equivalent to 0.7 per cent). Smart battery vendors could present cost savings over the battery's expected lifetime in order to help consumers understand the real cost savings associated with their purchase.

2. Just in time explanations & Chunking [style/formatting]: The behavioural literature shows that people respond differently to prompts depending on when they occur (BIT, 2014). **Providing information to consumers when it is most relevant to them appears to improve comprehension.**

The Financial Conduct Authority (FCA) ran an experiment to determine the most effective way to present asset management charges in order to improve, investors' understanding of the charges (FCA, 2018). The experiment tested three interventions in combination with a warning at the top of the webpage that presented fund options. The researchers found that displaying a charges summary and comparison chart on a 'review screen' right before investors finalized their selection improved understanding more than placing the comparison chart on fund-specific pages that investors browsed while making their decision.

'Just in time' explanations can be effective when combined with 'chunking' information into the most relevant points for a given moment. BIT has previously found that chunking financial information increased comprehension by mitigating information overload (BIT, 2018a). We built on that finding in an online experiment that was part of BIT's series of work on improving consumer comprehension of terms and conditions (see slide 8 and 9). We tested deploying pop-up text boxes that give consumers information about how companies will use each specific piece of information they provide as the consumer fills out an online form. The timely pop-ups increased comprehension levels up to 9% compared to providing the information at the bottom of the webpage.

Case study: Integrating multiple EAST insights to improve comprehension of financial information

In partnership with the Money Advice Service, BIT generated and tested new, behaviourally informed ideas to solve personal finance challenges facing consumers in the UK (BIT, 2018a). Based on previous research, one key concern we focused on was that people do not understand that and how they would be charged a balance transfer fee for transferring a balance from an old credit card to a new credit card. To address this, BIT tested a credit card price comparison tool designed to improve consumer comprehension of balance transfer fees. The new tool combined several behavioural insights shown to improve comprehension:

- **Easy** (shortening): Presented the most important information as 4 or 6 'Key Facts'
- **Easy** (display numbers in practical units): Represented costs as pound values rather than percentages
- **Attractive** (images, diagrams, and animation) & **Social** (relatability): Made the information interactive by adding a slider that provided feedback on the costs of transferring various balances

We tested the new tool in a randomised online experiment, in which participants viewed either the new tool or a standard credit card provider website. The new tool caused a statistically significant increase in the average number of questions about balance transfer fees that participants were able to answer correctly. Participants who viewed the new tool with '6 Key Facts' had 16% higher comprehension scores than participants who viewed the standard website; participants who viewed the new tool with '4 Key Facts' had 21% higher comprehension scores.

Tools that combine a variety of behavioural insights, including both phrasing and formatting interventions, have the potential to improve consumer comprehension of smart battery technology.

4 key facts about this card
Takes less than 2 minutes to read
1. Balance transfer fee
You'll be charged £1.95 every £100 of debt transferred for the first 60 days. After this it becomes £5.00 for every £100 transferred.
Use this slider to work out how much you will pay in fees:
£100
£0
£2,000
If you transfer
£100
It will cost
£1.95
2. Interest on balances transferred
You'll be charged £0 in interest for the first 38 months, then £20.90 per £100 per year.
If you transfer a balance after 60 days, you will pay the higher interest rate immediately.
3. Interest on purchases
You'll be charged £0 in interest for the first 3 months, then £20.90 per £100 per year.
4. You can lose your £0 offers
You'll lose your promotional offers if you miss a minimum payment or go over your credit limit.

Trust

THE
BEHAVIOURAL
INSIGHTS
TEAM

Trust in information sources

Comprehension of information about smart batteries is crucial, but it is not sufficient to empower consumers; consumers need to trust information in order to use it.

The level of trust that people have in a piece of information is affected by much more than the information itself. How information about smart batteries is presented and who it is coming from may affect whether consumers deem it credible. Some of the same techniques that help consumers comprehend information also increase their level of trust in it.

For the purposes of this review, we define trust to mean the belief in the competence, dependability and security of information (Kini & Choobineh, 1998). Much of the research included in this review measures self-reported levels of trust in information or organisations. This review organises evidence about techniques for promoting consumer trust in sources of information into two categories: 'online environment and context' and 'messengers'.

Summary of findings	
Online environment and context	**Messenger**
Professional website design and layout Avoid the appearance of marketing or 'upselling' Present information simply and in a way that is relatable to the consumer	Consumer organisations, governments, suppliers, and social networks all have the potential to be effective The most trusted messenger is context- and product-specific.

Online environment and context

Website professionalism: **Website design influences customers' trust in an organisation or company.** Seckler et al. (2015) found that distrustful user experiences online are mostly an effect of graphical and structural design issues of a website. Lowry, Wilson, and Haig (2013) used a randomised online experiment to demonstrate that logos and websites with specific features that invoke trustworthiness—such as consistency, stable shapes, simplicity, contemporariness, and reassuring colours—increased perceived trustworthiness of the organisation represented by a website. The effect size was largest when a trustworthy logo and website design were used in combination. In BIT's and BoE's experimental study of Bank of England Inflation Report (see slide 9), a thematic analysis of responses from participants found that 'visually professional' presentation was a frequently cited reason for higher levels of trust.

De-emphasize offers: In two separate consumer research reports on consumer disclosure formats, researchers found that **providing consumers with offers or explanations of better deals available sometimes caused suspicion among consumers.** Consumer research about 'switching boxes'— proposed disclosures about interest rates on consumer's existing account and comparable accounts from other providers — found that consumers interpreted the boxes as upselling when it was not clear to them that the disclosure was a legal requirement (Worton, Jones, & Light, 2016).

A report commissioned by Ofcom, the UK's government regulator for gas and electricity markets, on the design of end-of-contract notifications found that leading a communication with an offer resulted in consumers seeing it as marketing information and overlooking the key message of the communication (2018). The researchers found that study participants preferred that any offers come at the end of the communication.

Simplification: In BIT's and BoE's experimental study of the Bank of England inflation report (see slide 9), after rating the trustworthiness of the information they had viewed, participants were asked to explain why they gave the rating they did. A thematic analysis of 500 randomly selected free-text responses indicates that making information easier to understand is likely to be an important means for increasing trust. Specifically, respondents with higher levels of trust in the information cited reasons such as 'clear and easy to understand' and 'simplified information'.

Relatability: In BIT's and BoE's experimental study of the Bank of England inflation report (see slide 9), a thematic analysis of 500 randomly selected responses from participants found that a common reason for distrust in the information presented was that 'information doesn't relate to respondents' situation/reality financially and economically.' Furthermore, participants who viewed the 'relatable' method of communicating the summary found the Bank more trustworthy.

Messengers

The literature shows that the type of messengers that are considered 'trusted' depends significantly on the audience and context (Moser, 2010). Experts (including consumer organisations, governments, and suppliers) and people from within a person's social network can all be effective messengers about consumer products in different situations. **The most trusted messenger for information on smart batteries may depend on the context and the content being presented (e.g. scientific information versus user experience).**

Experts: People are influenced by messengers who are perceived as experts (Wilson & Sherrel, 1993); however, experts are not the most trusted or most appropriate source with every audience or message (Moser, 2010). An experimental study conducted by the European Commission found that endorsements from consumer organisations had positive effects on participant's self-reported trust in a company (Elshout et al., 2016). The study found that which quality cue was trusted most depended on the type of online store consumers were visiting. For domestic online stores, a national consumer organisation was trusted most; for foreign stores, a European consumer organisation was trusted most. A study of nutritional labels found that an endorsement by national and international health organisations strongly increased labels' credibility (Feunekes et al., 2008).

Familiarity: The most effective messenger for information about smart batteries may depend on which organisations consumers recognize and respect in the space. Ofgem, the UK's government regulator for gas and electricity markets, tested whether a letter alerting consumers to cheaper market offers would be more effective if it was Ofgem-branded or Supplier-branded (Ofgem, 2017). Ofgem found that consumers responded to the Supplier-branded letters at a higher rate than the Ofgem-branded letters, possibly due to higher brand recognition.

Social network: People trust information that comes from their own social network (Moser, 2010). People are more influenced by messengers who are demographically similar to them (Cabinet Office, 2010) and trust can be based on a messenger belonging to one's own social or cultural group (Moser 2010). Seckler, Heinz, Forde, Tuch, and Opwis (2015) found that trustful user experiences online are based on social factors such as reviews or recommendations by friends. Pan and Chiou (2011) found that online messages about goods are viewed as more credible when the messages are posted by those perceived to have close social relationships. In one experiment, researchers exposed participants to positive or negative feedback about hotels from Facebook friends and found that positive comments from Facebook friends increased trust in hotels (Ladhari & Michaud, 2015). Moser (2010) asserts that on the question of how cheap or easy to understand and use an energy-efficient appliance is, one's friend or neighbour may be trusted more than an expert.

Conclusion to the evidence review

As smart home technology proliferates, consumers need information that they can comprehend and trust in order to make empowered decisions in the marketplace. In service of that goal, Citizens Advice seeks to establish best practices for the presentation of information about smart batteries. As a first step, this review summarises the existing evidence on effective methods for presenting information to facilitate consumer comprehension and trust. As is apparent from this review, there is plentiful research on information provision for comprehension in many fields, including utility contracts, online terms and conditions, personal finance products, and traditional home appliance sales. In reviewing that evidence, we identified some key principles of information provision that appear to work across contexts. We found that applying the core principles of behavioural science (making things easy, attractive, social, and timely) can improve consumer comprehension. Additionally, we found evidence for specific techniques and messengers that inspire trust in the information provided.

Having identified successful techniques for information provision across different fields and types of consumer products, we will now apply our learnings to discover which techniques maximise comprehension in the specific context of smart batteries. Our next step is to draw on the successful techniques identified in this review to design several prototypes of information provision about the benefits and requirements of use for smart batteries. We will then run an online experiment to test comprehension of our designs and conduct interviews with vulnerable consumers. This research will allow us to identify effective ways to display smart battery information, and contribute to the body of knowledge about consumer empowerment in the rapidly growing field of smart home technologies.